Model 515B

and

Model 515C

Service Manual

Pulse Oximeter

This manual covers Model 515B (Cat. No. 6500-00) and Model 515C (Cat. No. 6550-00)

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Catalog No. 6500-90-01 / 6550-90-01

Novametrix Medical Systems Inc. Wallingford, Connecticut, U.S.A. 06492.
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1 Description

This manual is written for personnel who service and/or maintain the Novametrix Model 515B or 515C Pulse Oximeter. The Model 515B/C provides reliable continuous measurement, display, and alerts for oxygen saturation (SpO_2) and pulse rate. The monitor can be powered from its rechargeable internal battery or from the AC Mains.

The Model 515B/C measures oxygen saturation using sensors that contain red and infrared (660 and 940 nanometer) light sources, called LEDs. The light energy from each LED is beamed through a sample cell—a pulsating vascular bed, the patient's finger or toe for example. The remaining light energy not absorbed by the sample cell reaches a light receptor in the sensor, called a photodiode. Oxygen saturated blood absorbs different amounts of light at each wavelength as compared to unsaturated blood. Therefore, the amount of light absorbed by the blood in each pulse can be used to calculate oxygen saturation.

The Model 515B/C is calibrated to display "functional" saturation. This differs from the "fractional" saturation value displayed by most co-oximeters. Functional saturation is defined as:

$$\text{Functional Saturation} = \frac{HbO_2}{100 - (COHb + METHb)}$$

HbO_2 = Percentage of hemoglobin saturated with oxygen
COHb = Percentage of carboxyhemoglobin
METHb = Percentage of methemoglobin

This can be considered to represent the amount of oxyhemoglobin as a percentage of the hemoglobin that can be oxygenated. Dysfunctional hemoglobins (COHb and METHb) are not included in the measurement of functional saturation.

Pulse Rate is calculated by measuring the time interval between peaks of the infrared light waveform. The inverse of this measurement is displayed as pulse rate.

The oxygen saturation and pulse rate values are updated once each second. Presence of a pulse is indicated visibly by a bar graph display, a plethysmogram graphic display (Models 515C only), and audibly by a "beep."

The Model 515B/C must be used in conjunction with SuperBright™ Sensors. These sensors have an 8700 series part number (e.g., 8776 or 8791).

1.1 Trademark Acknowledgments

SuperBright, Y-STRIP and Y-SENSOR are trademarks of Novametrix Medical Systems Inc.

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2 Patient Safety

Pulse oximetry is a non-invasive method of monitoring the oxygen saturation of arterial blood. Pulse oximeters display oxygen saturation of functional hemoglobin and therefore the accuracy may be interfered with by carboxyhemoglobin or other dyshemoglobins present in significant concentrations. Oxygen saturation monitoring is intended to be used in a variety of clinical situations, including, but not limited to respiratory therapy, anesthesia, intensive care, and emergency.

The Model 515B/C Pulse Oximeter has electrically isolated inputs. Patient leakage current flowing from the instrument to ground is limited to less than 10 µA at 120 V, 60 Hz. Patient isolation is greater than 10 MΩ, 2500 V rms at 60 Hz. For maximum patient and operator safety, the following procedures are recommended;

- Failure of Operation: If the monitor fails to respond as described, do not use until the situation has been corrected by qualified personnel.
- Keep the Model 515B/C and its accessories clean.
- Do not operate the Model 515B/C when it is wet due to spills or condensation.
- Do not operate the Model 515B/C if it appears to have been dropped or damaged.
- Connect the line cord only to a grounded hospital grade outlet. The Model 515B/C should be connected to the same electrical circuit as other equipment in use on the patient. Outlets on the same circuit can be identified by the hospital's engineering department.

2.1 Indications and Usage

The Model 515B/C is intended to be used for monitoring functional oxygen saturation and pulse rate in circumstances where it is desirable to monitor patient oxygenation. The monitor is designed to monitor all patients including adult, pediatric, and neonatal. The Model 515B/C is not intended for any other purpose.

NOTE: Components of this product and its associated accessories which may have patient contact are free of latex.

2.2 Warnings

Warning
Indicates a potentially harmful condition
that can lead to personal injury.

- **Explosion Hazard:** Do NOT use the Model 515B/C in the presence of flammable anesthetics. Use of this instrument in such an environment may present an explosion hazard.
- **Electrical Shock Hazard:** Always turn the oximeter off, and remove the AC power cord before cleaning it. Do NOT use a damaged sensor or one with exposed electrical contacts. Refer servicing to qualified service personnel.
- **Patient Safety:** Extreme care should be exercised with neonates to assure continued circulation distal to the sensor site after application.
- **Failure of Operation:** If the oximeter fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- **Data Validity:** The Pulse Oximeter should NOT be used as a substitute for an ECG monitor. The oximeter's Pulse Rate display reflects the pulsatile flow found at the patient extremity connected to the sensor. This rate can be affected by many factors and may occasionally be "frozen."
- **Care** should be exercised to assure continued peripheral perfusion distal to the SpO_2 sensor site after application.
- **Data Validity:** Do NOT attach a sensor distal to a blood pressure cuff. Valid data CANNOT be processed when the cuff is inflated. Attach the sensor to the limb opposite to the site used for the blood pressure cuff.
- **Data Validity:** Inaccurate SpO_2 and/or Pulse Rate measurements can be caused by any of the following:
    - Incorrect application or use of a sensor
    - Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin
    - Significant levels of indocyanine green, methylene blue, or other intravascular dyes
    - Exposure to excessive illumination such as surgical lamps - especially ones with a xenon light source, or direct sunlight
    - Excessive patient movement, venous pulsations.
    - Electrosurgical interference.
- **Do Not** apply Y-Sensor tapes or wraps so tightly that circulation is restricted. Inspect site often for adequate circulation - at least once every four hours. When applying sensors take note of patient's physiological condition. For example, burn patients may exhibit more sensitivity to heat and pressure and therefore additional consideration such as more frequent site checks may be appropriate.

2.3 *Cautions*

Caution
Indicates a condition that may lead to equipment damage or malfunction.

- Do not operate the Model 515B/C when it is wet due to spills or condensation.
- Do not operate the Model 515B/C if it appears to have been dropped or damaged.
- Never sterilize or immerse the monitor in liquids.
- Do not sterilize or immerse sensors except as directed in this manual.
- Excessive tension should not be applied to the sensor cable.
- Do not store the monitor or sensors at temperatures less than 14 °F (-10 °C) or greater than 131 °F (55 °C).
- Do not operate the monitor or sensors at temperatures less than 50 °F (10 °C) or greater than 104 °F (40 °C).
- Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.
- Do not stretch the finger sensor open beyond the limit for which it was designed. Overstretching the pulse oximeter finger sensor can damage the sensor and potentially affect pulse oximeter readings. Overstretching can be prevented: avoid opening the sensor by any means other than squeezing the grips; *DO NOT* force the sensor onto large objects such as a bedrail.

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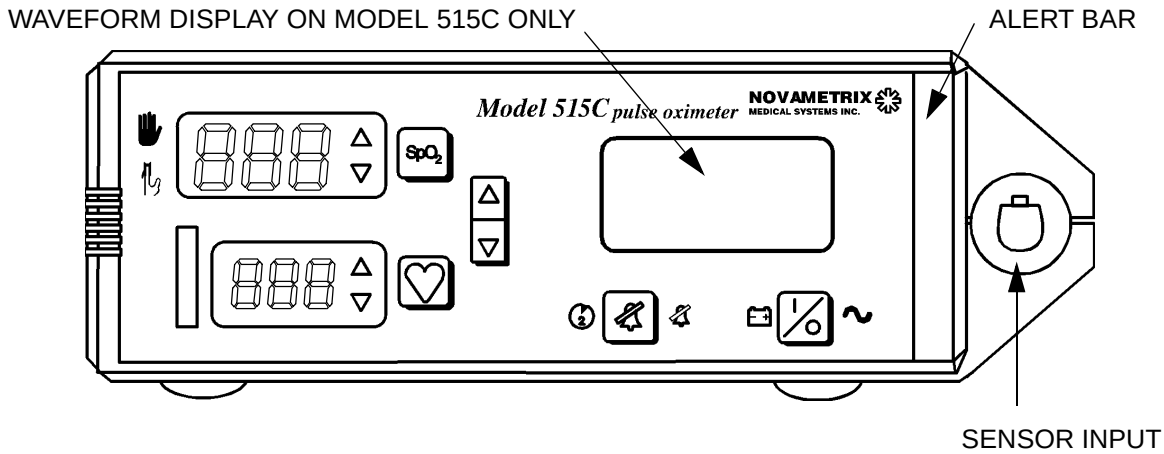
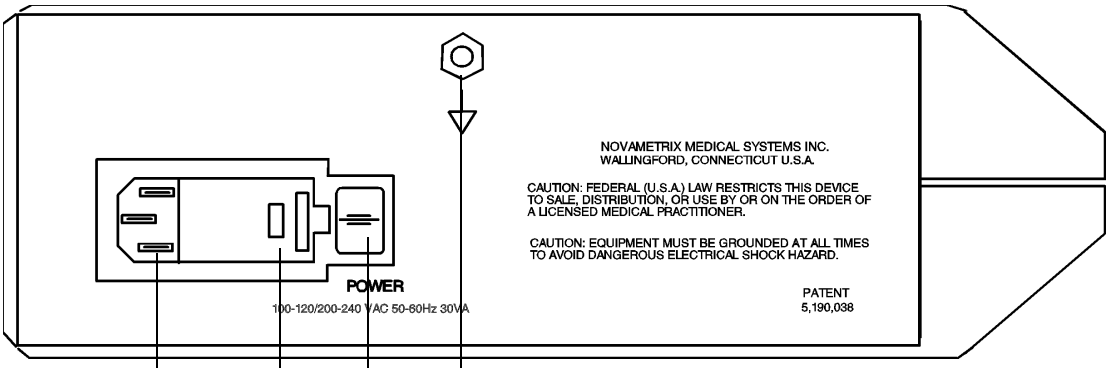
3 Front and Rear Panel Illustrations



	POWER button - Press to turn the monitor on or off.		AC indicator - Green when the monitor is connected to AC power and rear panel power entry module switch is set to "|" (ON). Also indicates the battery is charging.
	Audio key - Press to toggle two minute silence, and reset alert conditions (when active). Press and hold for audio disable.		Battery icon - Green when operating on battery with a charged battery, orange when battery power is diminished, flashes red when battery power is at a critical low.
	Pulse Key - Sets pulse rate alert limits when used with the ▲ ▼ keys. Press and hold to set auto alert limits.		Finger probe icon -Flashes red when no probe connected or probe off patient. Red for any sensor errors.
	SpO_2 key - Sets saturation alert limits when used with the ▲ ▼ keys. Press and hold to set auto alert limits.		Hand icon - Yellow when monitor is searching for valid signal and data is being held.
	Increase/decrease keys - Press to set pulse and alert audio level. Sets alert limits when used in conjunction with SpO_2 and Pulse keys. Press and hold to control graphics display contrast on Models 515C (Model 515B does not have graphics display option).		Audio disabled icon - Flashes yellow when the audio has been disabled.
			Two minute silence indictor - Illuminates yellow when the audio has been muted for two minutes.
	Saturation and pulse rate displays - Saturation and pulse rate values will appear. Status messages will appear if necessary, see "Troubleshooting" on page 31. Arrows indicate alert status or that alerts are being set.		Signal bar - Pulses with respect to monitored pulse rate. Amplitude corresponds to signal strength.

EARLIER REAR PANEL


NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
PATENT 5,190,038
POWER
100-120/200-240 VAC 50-60Hz 30VA

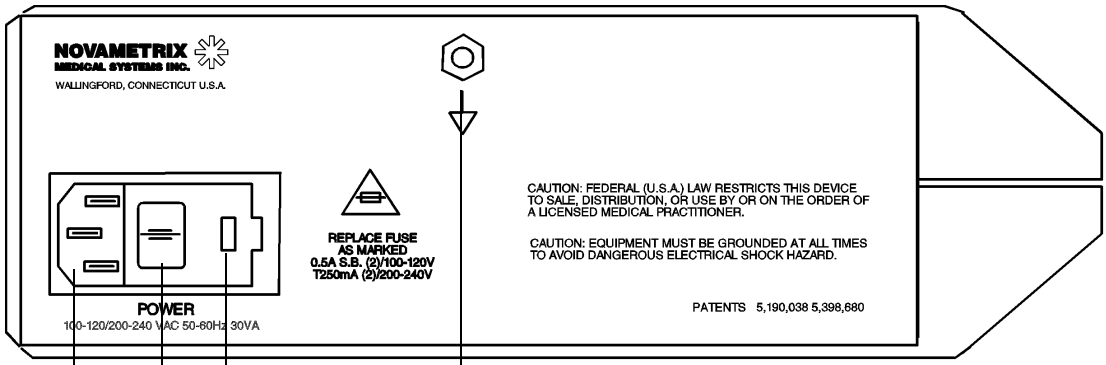
Ground stud - Use to connect monitor's chassis to earth ground.

Rear panel power switch - Set to "|" allows AC mains to power monitor, set to "O" switches AC mains power off.

Voltage select/fuse compartment - Sets mains operating voltage and houses mains fuses.

Power cord entry - Plug power cord into this receptacle. Use only hospital grade three wire plugs for connection via supplied power cord.

NEWER REAR PANEL


NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
REPLACE FUSE AS MARKED
0.5A S.B. (2)/100-120V
T250mA (2)/200-240V
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
PATENTS 5,190,038 5,398,680
POWER
100-120/200-240 VAC 50-60Hz 30VA

Ground stud - Use to connect monitor's chassis to earth ground.

Voltage select/fuse compartment - Sets mains operating voltage and houses mains fuses.

Rear panel power switch - Set to "|" allows AC mains to power monitor, set to "O" switches AC mains power off.

Power cord entry - Plug power cord into this receptacle. Use only hospital grade three wire plugs for connection via supplied power cord.

4 Summary of Operation

This section gives a *brief* description of the operation of the Model 515B/C monitor. For more detailed information refer to the Model 515B/C User's Manual (Cat. No. 6500-23/6550-23).

4.1 Turning the monitor ON/OFF

The key controls powering the monitor on and off. To charge the battery from AC mains ensure that the power cord is connected and plugged into a hospital grade three prong outlet. Set the rear panel power switch to | (ON). Check that the front panel icon is green, this indicates that AC mains power is connected to the monitor and charging the internal battery. The monitor will operate on its internal battery power when the rear panel power switch is set to O (OFF), or if the power cord is removed.

When operating on a fully charged battery the icon on the front panel will turn green. As the battery charge diminishes and reaches a low level the icon will turn orange. When the battery has reached a critical low the icon will flash red. If AC mains power is not connected at this time to power the unit and recharge the battery, the monitor will flash a red icon, emit an alarm tone, then shut itself off.

4.2 Displays

When a sensor is connected to the monitor and detecting pulsatile data the SpO_2 and pulse rate values will appear in their respective displays. The signal bar will pulse in accordance to the pulse rate, and on Model 515C, the graphics display will show a plethysmogram (the waveform will travel from left to right).

The and indicate conditions regarding sensor activity; poor signal, probe not connected, etc. Refer to the User's Manual for more detailed information (Cat. No. 6500-23/6550-23).

4.3 Adjusting Alert Limits

The Model 515B/C can have its alert limits manually adjusted, or automatically adjusted[1]. To manually set the alert limits press either for SpO_2 limits, or for pulse rate limits. Pressing the appropriate key once will allow adjustment of the high limit using the up/down arrow keys. Pressing the same button twice will allow adjustment of the lower alert limit. If the key is pressed a third time the monitor will exit the alert limits setting mode and return to normal operation and displays.

For example: Press once, use ▲ ▼ to adjust upper alert limit. Press again, use ▲ ▼ to adjust lower alert limit. Press a third time to exit alert limits mode, or wait for 10 seconds.[2]

1. For automatically set alert limits the monitor must first have acquired valid data on which to base the limits on for a specified amount of time.

To activate auto alert limits press and hold either the SpO2 key for saturation, or the ♡ key for pulse rate. The monitor will temporarily display the new upper, then lower limits on the saturation or pulse rate display, depending upon which limits were set, then return to normal operating mode.

4.4 *Adjusting Volume Levels*

Both pulse beep and alert volume can be separately adjusted. To adjust the pulse beep press ▼, "Pul" will appear in the SpO_2 display, use ▲ ▼ to adjust the volume level from 0 through 7. To adjust the alert volume press ▲, "Alr" appears in the SpO_2 display, use ▲ ▼ to adjust the alert volume level from 1 through 7.

NOTE: When the monitor is sounding an alert (with audible alerts enabled - 🔔 not illuminated), the ▲ ▼ keys will control the alert volume only.

4.5 *Muting Alerts*

The 🔕 key controls two minute audio muting, audible alert disable, and alert acknowledge. Pressing 🔕 will activate the two minute audible alert mute. Press and hold 🔕 until 🔔 illuminates to activate audible alert disable. Pressing 🔕 again will cancel either the two minute mute or the audio disable (which ever is active). Press 🔕 to acknowledge and reset alert conditions.

4.6 *Contrast*

Press and hold the ▲ key to vary the contrast of the graphics display (on Model 515C only). The SpO_2 display will show "Con" to indicate that the monitor is in contrast adjust mode. Use the ▲ ▼ keys to vary the contrast. The monitor will return to normal operating mode ten seconds after the last key depression.

2. There is a ten second time-out counter that starts each time the SpO_2 or pulse key is pressed. When the counter times-out the monitor will return to its normal operating mode.

5 Electronic Theory of Operation

The electronic theory of operation of the Model 515B/C Pulse Oximeter is detailed in the subsections below. Refer to Section 13, *Schematics and Assembly Drawings*, on page 63 for schematics and assembly prints.

5.1 *2532/2725 Power Supply Board*

The Power Supply Board contains the circuitry needed to charge the battery from the AC Mains (line voltage). The monitor may be supplied with either the 2532 or the 2725 power supply board. The 2532 board is manufactured with thru-hole components while the 2725 is mostly surface mount technology. The circuitry is identical therefore the theory of operation that follows applies to both assemblies.

5.1.1 AC Mains and Battery Operation Overview

The Model 515B/C is powered from its internal 12 volt battery that is charged when the monitor is connected to the AC line. The green ∿ (sine wave shaped) front panel indicator illuminates when the line cord is connected and the rear panel power switch is in the "|" (On) position. This indicates that AC Mains power is charging the battery.

If AC mains power is removed by unplugging the line cord, or setting the rear panel power switch to the "0" (Off) position, the monitor will operate for up to eight hours from its internal 12 volt lead-acid battery on a full charge. As the battery voltage runs low (≈11.5 volts), the (battery icon) on the front panel will turn orange. At this point, the AC Mains should be reconnected to charge the battery.

If the monitor continues to be powered from a battery in a low voltage situation, at approximately 10.5 volts, a continuous alarm sounds for sixty seconds while the battery indicator will flash red. A "bAt" and "Lo" message will appear in the SpO_2 and pulse rate displays respectively. If this alarm is ignored, the monitor will shut down. The AC mains should be connected to the monitor to recharge the battery before this occurs.

5.1.2 AC Mains Operation

Reference the Overall Wiring Diagram. The AC Mains voltage enters the monitor at the rear panel Power Entry Module (PEM101). This device contains a built in RFI power line filter, a double-pole single-throw switch that opens and closes both AC input lines, fuses, and an input voltage selection key.

The filtered, switched, and fused output of the Power Entry Module is fed to the primary coils of the system transformer, T301. Reference the Power Supply schematic 2532-03 or 2725-03. The secondary output from T301 is rectified by D1 (bridge rectifier) and filtered by C1. The (loaded) DC voltage at this point is approximately 20 volts.

The 20 volts DC is fed to the battery charging regulator IC1 (pin 5) through Q1. Biasing for Q1 is accomplished by D2, R1, and R2 when AC power is applied. When running on battery power,

Q1 is biased off by R1, R2, and D3. This prevents the battery from trying to power the battery charger regulator.

The output of switching regulator IC1 pin4 is rectified and filtered by D4, C4, and L1, then fed to the battery through current sense resistor R3 and fuse F302, to J302 pin 1 (VBAT+). The battery float charge voltage is maintained at 13.2 volts except for fast charge that is regulated at 14.4 volts. The output is also monitored for over current conditions. These parameters are controlled by IC3 and associated circuitry. When the battery charge current exceeds a preset limit, IC3 pin 7 goes high which biases Q2 on, this in turn shorts out R12 which affects the feedback control (FB) to IC1 (pin 1). With R12 shorted out, the control resistors R14 and R13 set the output voltage to 14.4 volts. When the charge current lowers, IC3 pin 7 goes low which biases Q2 off, this puts R12 back into the feedback control which now consists of R12, R13 and R14; setting the voltage to 13.2 volts. When more than the maximum charge current flows through R3, IC3 pin 1 shorts IC1 pin 2 to ground, that shuts IC1 off until its next switching cycle. When the current reaches a safe level IC3 pin 1 allows IC1 to remain on.

5.2 *Main Board*

The 2721 or 2723 Main Board contains all the analog and digital circuitry that controls the sensor, front panel display, and user interface. The isolated power supplies, microprocessor, analog circuits, and memory are all contained on this board. The 2722 or 2724 version contains the graphics display for model 515C, otherwise the circuitry is identical. Units with the newer 2723 (for Model 515B) or 2724 (Model 515C) board can be identified with an “X” in the serial number suffix.

5.2.1 Power On/Off Control Circuitry

When connected to the AC line (front panel AC icon illuminates green) the internal battery is charging, this occurs whether or not the monitor itself is turned on. The monitor is powered on by pressing the front panel power key, pressing this key while the monitor is on will shut it off. The actual turning off is controlled by the processor, this enables the processor to control when the power is removed to avoid corrupting RAM contents (e.g. turning power off while writing to, or reading from RAM).

Power enters the main board through J404, see page 4 on schematic. When the monitor is connected to the AC mains power, the LINEST voltage will be high indicating that AC line power is available and charging the battery. The LINEST line will bias the green LED D16 on through current limiter R28 (see page 2 on schematic). This LED illuminates the AC indicator icon on the front panel. When the monitor is running off of its internal battery (no AC mains power available), the VBATTERY line will be supplying power for the monitor. This will cause D17 to be reverse biased (LINEST low, VBATTERY @ battery voltage) and no voltage will appear at LINEST, therefore D16 will be biased off.

When the front panel power key is pressed VBATT biases Q8 on through R31, R97, and D18. When Q8 is on, VBATT biases Q10 on through R91 and R92, this in turn powers IC17, a pulse width modulated switching power supply. The LEDPWR supply is generated by IC17, Q11, D32, T1 and filtered by C59-C63 (C89 added on 2723/2724 board). The voltages used by the main board are all derived from the LEDPWR supply.

When the monitor is on and the front panel power key is pressed (to turn the monitor off), IC10 pin 12 will go low (see page 1 on schematic). This will drive the output of IC8 pin 8 (PWRNMI*) low when the KEYS* line is brought low by the processor (IC1 pin 9). The PWRNMI* line drives the NMI line of the processor, when this line is brought low the processor will bring the PWROFF line high through IC14 pin 12. When the PWROFF line is high, Q13 will turn on, this in turn sets the PFI input (pin 4) of IC4 low. This will set the PWROFF* line

IC4 pin 5 low, biasing Q2 on (page 4 on schematic). With Q2 on, Q8 and Q10 will be biased off, shutting down IC17 which turns the monitor off.

5.2.2 Power Supplies and Voltage References

See page 4 on schematic. The 5 volt supply VDD is regulated by IC18, a low dropout regulator. The -VA supply is generated by IC19 from the LEDPWR supply. This supply is synchronized to front end timing signals by the SYNC line via C82, R127, R120, D35, and Q7. Without this synchronization, ailiasing frequencies may interfere with sensor measurements. The +VA supply is drawn from the LEDPWR line through filter coil L2.

The LEDSRC supply, used by the sensor LEDs, is regulated by IC20. Fuse F201 protects against over current conditions. This supply is connected to the sensor‘s LED anodes when a sensor is connected.

See page 3 on schematic. A -5 volt, and a 2.5 volt reference (VREF2.5) are needed for the 8 bit D/A converter IC31, the A/D converter IC26, and for the 20 bit A/D converters IC23 and IC24. The 2.5 volt reference is generated by IC29 from the +VA supply. The output of IC29 pin 6 (VREF2.5) feeds the input of inverting amplifier IC30a. The output of IC30a drives the base of Q12 which creates a low impedance -5 volt source -V5 at its emitter. The -5 volt source is used by the eight channel multiplexor IC25, the 20 bit A/D converters IC23, IC24, and the eight bit D/A converter IC31.

5.2.3 Sensor LED Drive Circuits

Each LED (one red and one infrared) in the sensor is driven separately. Since the circuitry is similar only one channel will be discussed, the corresponding components for the other channel will appear in brackets. See page 3 on schematic.

The VLED voltage is used by both channel’s drive circuitry. When IC31 is enabled by the WR* and DACCS* lines, the processor programs a voltage by inserting a particular value on the data lines D0-D7. This voltage appears at the output of IC30b pin 7 and is labelled as VLED.

When the REDLED* [IRLED*] line is low Q3 [Q4] will turn off, this allows the VLED voltage, divided by R48 [R46] and R47 [R49], to drive the non-inverting input of IC27a [IC27b]. When IC27a [IC27b] output is high, Q6 pins 3, 4, 5, 6 [1, 2, 7, 8] will turn on, this pulls current through the sensor LED from the LEDSRC supply (fed to the sensor from J403 pin 1). When the REDLED* [IRLED*] line is high, the input of IC27a [IC27b] is brought to ground potential because Q3 [Q4] is biased on. This shuts Q6 off resulting in no current flow through the LED.

5.2.4 Sensor Photodiode Return Path

Light, from the sensor’s Red or Infrared LED, shines through the pulsating vascular bed (the patient’s finger, toe, etc.) placed between the LEDs and the photodiode. Some of this light emerges from the tissue and impinges on the photodiode, causing the photodiode to conduct current. See page 3 on schematic. IC21b pins 5-7 are set up as a differential amplifier that converts this input current to a voltage at the amplifier output. The sensors are wired such that photodiode current produces a positive voltage at IC21b pin 7[1].

The voltage at IC21b pin 7 is presented to an analog switch IC28b pin 6. This switch is controlled at pin8 by $\overline{\text{INSIG*}}$ (Input Signal), and will be closed (IC28b pins 6 and 7 connected) except if the monitor is in a Probe Off Patient condition or is undergoing its self-test at system power up. The switch IC28c pins 9-11, controlled from $\overline{\text{SIGND*}}$ (Signal Ground), will be open

1. The Model 515B/C uses SuperBright™ sensors (part number 87xx series). If a non-SuperBright™ (Novametrix part number 86xx series) sensor is connected, IC4b pin 7 will go negative.

(no connection between IC28c pins10 and 11) except as noted above for the switch at IC28b pins 6-8. As a result, the IC21b pin 7 voltage passes undisturbed to the high pass filter consisting of R70 and C28.

The $\overline{\text{ASAMP*}}$ signal is active low whenever either sensor LED is turned on. This causes Q5 to turn off and the signal at C28 passes through to IC21a pin 3. The $\overline{\text{ASAMP*}}$ line returns to a logic high when neither LED is being driven, causing Q5 to turn on. With Q5 conducting, any voltage at C28 is discharged to ground and the next pulse will charge C28 from a known level. If it were not for Q5, any charge remaining on C28 from the previous pulse, or from ambient light reaching the photodiode, would be added to the charge from a new pulse—creating measurement errors.

If the signal at IC21a pin 1 is the product of the Red LED being turned on, then $\overline{\text{RDSAMP*}}$ will go low and close the switch at IC28a pins 2-3. This sends the signal to a sample and hold circuit consisting of R75 and C41 (that maintains the signal until next sample pulse arrives), a gain stage (IC22a), a filter/divider network (C40, R81 and R82), and finally, to the Red channel Analog-to-Digital Convertor (ADC) IC24.

If the signal at IC21a pin 1 is the product of the Infrared LED being turned on, then $\overline{\text{IRSAMP}}$* will go low and close the switch at IC28d pins 14-15. This sends the signal to a sample and hold circuit consisting of R73 and C27 (that maintains the signal until next sample pulse arrives), a gain stage (IC22b), a filter/divider network (C24, R78 and R79), and finally, to the Infrared channel Analog-to-Digital Convertor IC23.

5.2.5 20-Bit Analog-to-Digital Convertor Self Calibration

The 20-bit ADCs are calibrated as part of the system self-test which occurs each time the monitor is turned on. At power up, the microprocessor sets the CAL line, and the system calibration input SC1 high. The CS5503 ADC will not operate while the CAL line is high. On the falling edge of the CAL signal, the ADC will initiate a calibration cycle determined by the state of the SC1.

The high at SC1 causes $\overline{\text{INSIG*}}$ to go high and reset $\overline{\text{SIGND*}}$ to a logic low. The high $\overline{\text{INSIG*}}$ opens the switch at IC28b pin8 so that IC28b pins 6 and 7 are no longer connected—disconnecting the returning photodiode signal from the rest of the circuitry. The low $\overline{\text{SIGND*}}$ signal closes the switch at IC28c pin9 and as a result, the input to the C28-R70 high pass filter (and thus the entire ADC input circuitry) is brought to ground potential.

The CAL line (which went high at power up) is reset low and ADCs IC23 and IC24 begin their calibration cycles. Because the analog input circuitry is grounded via $\overline{\text{SIGND*}}$, only circuit offset voltages can be present at the (pin 9 AIN) inputs. The calibration cycle sets the ADC "zero" point to equal this voltage, thus compensating for any circuitry offsets. The ADC then sets its "full scale" point to equal the voltage at its VREF (pin 10) input. This completes the calibration cycle.

The ADC can now start sampling its input and converting it to a 20-bit digital word. The processor resets SC1 to a logic low, causing IC28c pin9 to open and IC28b pin8 to close. The photodiode signal can now reach the ADCs. See *Sensor Photodiode Return Path* on page 13.

5.2.6 20-Bit Analog-to-Digital Conversion

Data from the Red and Infrared channels is sampled by the 20-bit measurement ADCs, IC23 and IC24 respectively. The analog input at pin 9 is converted to a digital representation with 20-bit resolution based on the input magnitude.

The CS5503 converter continuously samples its input, converts the value to a digital word, puts the word in its output buffer (overwriting previous buffer contents), then repeats the process by again sampling its input. The frequency of the sample/convert/overwrite-buffer sequence is based on the 3.2768 MHz clock signal at the ADC pin 3 (ADCCLK) input.

The microprocessor starts a read cycle of the Infrared channel by bringing IC23 pin 16 (ADCIRCS*) low. A Red channel read starts when IC24 pin 16 (ADCREDCS*) is brought low.

On the falling edge of the ADC's $\overline{\text{CS*}}$, the output word's MSB (most significant bit) appears at the pin-20 SDATA (Serial Data) output. The SDATA line connects directly to the microprocessor's serial input (RXS) pin. The remaining bits (in descending order) are output from SDATA with subsequent falling edges of the Serial Clock (SCLK) input at pin 19. The SDATA output automatically goes to a 3-state (high impedance) condition after completing a word transmission, thus freeing the data line for other uses (i.e., the other ADC channel).

The Serial Clock rate is significantly slower than the ADC sampling rate. As a result, the ADC rewrites its output buffer with new information at a faster rate than the data can be read from the buffer. No conflict occurs, however, because while $\overline{\text{CS*}}$ is low (during the read cycle), the ADC does not update its output buffer—the current word is not overwritten. After the processor receives the entire word, it allows the convertor's $\overline{\text{CS*}}$ to return high, and the ADC resumes its sample/convert/overwrite-buffer cycle.

5.2.7 Sensor Status Decoding and Conversion

The microprocessor monitors several sensor parameters in addition to the Red and Infrared data channels. It monitors the status parameters, as well as the voltage of the monitor's internal battery. See page 3 on schematic.

The 8-to-1 multiplexer, IC25, decodes the A0MUX-A2MUX input address lines and connects one of eight status parameter inputs to the multiplexer output at IC25 pin 3. Resistor R88 and diode D19 prevent negative voltages from reaching the input to the analog-to-digital converter, IC26.

IC26 is an 8-bit analog-to-digital convertor with a serial data output. While the IC26 Chip Select ($\overline{\text{ADC3CS*}}$) input is high, the CLK input and SDATA output are in 3-state mode. When $\overline{\text{CS}}$ is brought low (under processor control), the most significant bit (D7) of the *PREVIOUS* data conversion becomes available at the SDATA pin. The remaining bits (D6-D0) are shifted out on subsequent falling edges of the CLK input. On the clock pulse following the one that shifts out the least significant bit (D0), the CLK and SDATA lines are returned to 3-state and the ADC performs a new conversion based on the input it receives from the IC25 channel selected by the A0MUX-A2MUX input address lines.

The ADC sample/convert/store-result cycle is based on internal chip timing and not the CLK input which (along with $\overline{\text{CS}}$) only controls serial data output. Thus the $\overline{\text{CS}}$ line is free to return high once the ADC cycle begins.

5.2.8 Front End Timing Signals

See page 1 on schematic. A 14 stage divider IC6, acts as a timing sequencer. The ADCCLK input is the clock input, the RESET line is the clear input, used for clearing the chip at power up. The Q4-Q11 outputs of IC6 are divided down from the clock input and feed IC13, the data sampling controller. The Q14 output of IC6 is used as an interrupt that is generated every 5 milliseconds (INT5MS).

The data sampling controller IC13 is a Programmable Electrically Erasable Logic device (PEEL). The PEEL uses the outputs from IC6 and generates the front end timing signals. These

signals control the sensor LED drive and the photodiode's return path circuitry during normal operation and calibration.

The RESET and SC1 lines control when the outputs of IC13 are active, both these lines must be low in order for IC13 to operate normally. The RESET line controls IC13 during power up, while the SC1 line is under processor control and will toggle when a probe off patient alert exists and during the power up self test.

Signal	Description
INSIG* Input Signal	This line will enable signals from the photodiode, or prevent signals from the photodiode from reaching the detection circuitry.
RDLED* Red LED	Controls the signals for the Red Led in the sensor.
IRLED* Infrared LED	Controls the signals for the Infrared Led in the sensor.
SIGND* Signal Ground	This is used to short out the inputs of the detection circuitry so that the system can compensate for offsets.
ASAMP* Analog Sample	This line is used to short out the capacitor used in the sample and hold circuitry to avoid having residual charge interfere with data sampling.
SYNC Synchronization	Synchronization signal used for the -VA supply.
IRSAMP* Infrared Sampling	Used for sampling the Infrared signal response from the photodiode.
RDSAMP* Red Sampling	Used for sampling the Red signal response from the photodiode.

5.2.9 Sensor Status Parameters

The sensor (and battery) status parameters input to the multiplexer IC25 (page 3 on schematic) are described below.

ADCFEDC: Photodiode DC Level.
Resistors R66, R67 and capacitor C33 form a voltage divider and low pass filter that provide a measure of the mean DC level at the output of the photodiode current-to-voltage amplifier IC21b pin 7. This signal is used in determining ambient light interference. If this line is examined while the sensor's Red and Infrared LEDs are turned off, then any DC level at IC21b pin 7 must be the result of ambient light impinging on the photodiode. If the DC shift is in excess of limits set in the software, a light interference message appears on the monitor's display.

ADCLPWR: Sensor LED Supply Voltage.
This channel, at IC25 pin 12, monitors the sensor LED supply voltage through a voltage divider consisting of R113 and R114. If a fault occurs that causes the LED supply fuse F201 to blow, or if the sensor wires are shorted, this channel reports the condition and the monitor will indicate an error condition.

ADCIRLED: Infrared LED Cathode Voltage.
A low pass filter consisting of R60, R61 and C51 provides a means to measure the cathode voltage of the sensor's Infrared LED. If the channel at IC25 pin 5 is sampled the monitor can determine if the LED is open circuit (zero volts at IC25 pin 5) or operational (approximately 2.5 volts at IC25 pin 5).

BATLEV1: Battery Level 1
The monitor's battery voltage is divided down by R94 and R106. The voltage at IC25 pin 1 is monitored, and if its magnitude is less than a predetermined value (encoded in the software) the monitor indicates a low battery warning.

BATLEV2: Battery Level 2, this signal is not used as of this writing.

LINEST: The LINEST line from the power supply is divided down by R94 and R106. The voltage at IC25 pin 2 is monitored to determine if the AC mains is connected and charging the battery.

ADCRDLED: Red LED Cathode Voltage.
A low pass filter consisting of R58, R59, and C50 provides a means to measure the cathode voltage of the sensor's Red LED. If the channel at IC25 pin 4 is sampled the monitor can determine if the LED is open circuit (zero volts at IC25 pin 4) or operational (approximately 2.5 volts at IC25 pin 4).

ADCVRD: This signal is not used as of this writing (not shown on 2723/2724 board).

ADCVIR: This signal is not used as of this writing (not shown on 2723/2724 board).

5.2.10 Serial I/O Controller

See page 1 on schematic. Digital data from the three Analog-To-Digital Convertors is read by the CPU through its clocked serial data input (SDATA) at IC1 pin 56. The PEEL IC7 acts as the Clocked Serial Input/Output (CSI/O) Controller.

Except during power up or Watchdog Timer reset, IC6 pin 3 provides an interrupt to the CSI/O controller in the form of a 5 millisecond period square-wave input to IC7 pin 7 (INT5MS).

On the rising edge of INT5MS, a CPU interrupt request is generated when IC7 pin 18 ($\overline{\text{CPUINIT*}}$) goes low. The CPU responds by sending the clock input to CSI/O controller (CKS) at IC7 pin 6 low. (This CKS line is inactive high unless a serial receive operation is in progress.) The CPU also sets up the ADC decode lines AA1 and AA0 at IC7 pins 5 and 4, and as a result, one of the ADC chip select lines ($\overline{\text{ADCIRCS*}}$, $\overline{\text{ADCREDCS*}}$, $\overline{\text{ADC3CS*}}$) is brought low, and the $\overline{\text{CPUINIT*}}$ line is disabled.

On the rising CKS signal a CLKS output pulse at IC7 pin 14 is sent as a serial clock input to the ADC selected by the decode lines. Decode results are shown below.

AA1	AA0	Decode
0	0	Red LED 20-bit ADC
0	1	Infrared LED 20-bit ADC
1	1	Sensor Status 8-bit ADC
1	0	Internal CSI/O signal (TEND)

Successive CKS/CLKS pulses cause the ADC data to be shifted out of the ADC (most significant bit first) along the serial data line (SDATA) to the CPU serial input (RXS) at IC1 pin 56.

After receiving the correct number of bits for the ADC being read, the CPU changes the AA1 and AA0 decode lines and exerts the Next line (NEXT*) at IC12 pin 12 low. This restarts the serial data shifting out of the newly selected ADC.

After all three ADCs have been read, the CPU sets the AA1 and AA0 decode lines to exert the internal TEND signal and set the 8-bit ADC to the next channel (so that it has time to settle before the next read of the ADC). This re-enables the CPUINIT line. At this point the CSI/O controller is reset awaiting an INT5MS pulse to begin the cycle again.

5.2.11 Microprocessor and Memory

The Model 515B/C is controlled by IC1, an 8 bit microprocessor running at 6.14 MHz (see page 1 on schematic). Crystal Y1 controls the operating frequency, system address lines are labelled as A0-A17, system data lines are labelled D0-D7.

The system program is contained in IC3 a 27CC101 EPROM, when both RD* and ROMCS* are low a read operation is performed on IC3. The ROMCS* line is controlled by the ME* line (Memory Enable) and address line A17. When both the ME* line and address line A17 are low, the ROMCS* line will go low (IC9 pin 6), this enables IC3.

System RAM is contained in IC2. When both the RD* and RAMCS* lines are brought low, a read operation is performed on IC2. With both WR* and RAMCS* low, a write operation will be performed. The RAMCS* line is controlled by the ME* line and address line A17. When address line A17 is brought high, and the ME* line brought low, IC9 pin 3 will go low activating the RAMCS* line. The ability of the RAMCS* line to reach the chip select of IC2 is controlled by Q15, unless the VDD supply is established, neither a read nor write can be performed on IC2 (system RAM).

5.2.12 Decoding

A three to eight line decoder IC11, is used for decoding various write, enable, and interrupt lines for the system. Address lines A4, A5, A6, and A7, and the IOE* (input output enable) and LIR* (load instruction register) lines from the processor, will enable one of the Q outputs of IC11. The table below lists the lines that are controlled by IC11.

Name	Function
DACCS* Digital to Analog Controller Write	Enables IC31 for writing, this controls the LED voltage VLED.
DISPCS1* Display Chip Select 1	Control signal for the graphics display (if installed)
DISPCS2* Display Chip Select 2	Control signal for the graphics display (if installed)
TONECS Tone Chip Select	Chip select for the tone generator IC32, and digital potentiometer IC33.
INT1* Interrupt #1	Spare interrupt (not shown on 2723/2724 board)
PWRNMI* Power Non-Maskable Interrupt	This line turns the monitor off. When the PWRSWIN line is brought high (by pressing the front panel POWER key) and the KEYS* line is low, the PWRNMI line will signal the processor to shut off.
PORT1WR Port #1 Write	This line is controlled by the WR* line of the processor and the PORT1CS* line from IC11. It enables writing to IC12, this controls the multiplexer lines, SC1 line for the 20 bit A/D Converters, control lines for IC7, and the LOAD line for the displays.

Name	Function
PORT2WR Port #2 Write	Controlled by the WR* line and PORT2CS* from IC11. This line will enable writing to IC14. The 20 bit A/D converter CAL line, front panel LEDs, and power off control are handled by IC14.
RDKEY* Read Keypanel	The KEYS* and RD* control this line that enables IC5 to read the keypanel for key depressions and the configuration header J406.
CNTRCS* Contrast Chip Select	Select line for the digital potentiometer IC34, used to adjust the contrast on the optional graphics display.

5.2.13 Microprocessor Supervisor

A microprocessor supervisory integrated circuit IC4 monitors the V_{DD} power supply for low voltage conditions, and the WDOG (watchdog) line to verify that the processor is still in control of the monitor. A failure of either of these two conditions will result in the monitor being shut off. It also controls turning the monitor off during a normal power down, see *Power On/Off Control Circuitry* on page 12.

5.2.14 System Output Ports

There are two output port chips IC12 and IC14, that control various lines for system control. The first port IC12, enabled when PORT1WR is high, controls the CSIO PEEL IC7, the analog multiplexor IC6, and the 20 bit analog to digital converters IC23, and IC24. The second port IC14, enabled by the PORT2WR line, handles the front panel LEDs and the CAL line for the 20 bit A/D convertors. The second port also controls turning the monitor off through the PWROFF line.

The output ports are selected by the decoding performed by IC11 and the WR* line. The signals controlled by the ports are listed below with a brief description of their function.

Signal	Description
AA0-AA1	Decode line for selecting ADCs.
SC1	Used for 20 bit ADC calibration.
LOAD	Control line for the display driver IC15
A0MUX-A2MUX	Selects one of six channels that will be switched to the serial A/D converter for conversion.
NEXT*	Used in decoding selection of ADCs.
CAL	De-activates the 20 bit ADCs prior to calibration.
2MIN_LED	Illuminates the 2 minute mute LED, D13.
AUD_OFF_LED	Illuminates the audio off LED, D14.
WAIT_LED	Biases Q9 on, which in turn illuminates the hand LED, D8.
KJL	Biases Q1 on, which in turn illuminates the four alert bar LEDS, D28-D31.
RED_BAT	Illuminates the red battery icon LED, D15.
GREEN_BAT	Illuminates the green battery icon LED, D15.

Signal	Description
PWROFF	Turns the monitor off, under processor control.

5.2.15 Displays

The front panel visual interface is made up of LEDs, the only exception is the Model 515C graphic display (an LCD DOT matrix). Both saturation and pulse rate displays consist of three seven segment displays with decimal points (for a total of six displays). The signal bar is a 10 segment LED array, the remaining indicators are LEDs. See page 2 on schematic.

The saturation and pulse rate displays are seven segment LED displays that are controlled by IC15, a display driver. In addition to controlling the eight segment displays, IC15 also handles the pulse bar, up/down arrow LEDs for saturation and pulse rate error displays, and the finger sensor icon LED. The remaining LEDs are controlled by their own signal lines.

LED	Signal Line
Alert Bar (D28-D31)	When the KJL line is brought high (from IC14 pin 15) MOS-FET Q1 will turn on drawing current through LEDs D28-D31.
Battery (D15)	Diode D15 is a bicolor LED that is controlled by the RED_BAT and GRN_BAT lines. When both lines are high the LED will appear orange, otherwise it will be the color of the active line (red or green).
D14	The AUD_OFF_LED (audio off) is generated from IC14 pin 17.
D13	The 2MIN_LED line from IC14 pin 18 will illuminate the 2 minute audio mute LED when brought high.
D8	Diode D8 is an LED bar that is actually made up of four LEDs housed in a common package. When the WAIT_LED signal from IC14 pin 16 is brought high then MOSFET Q9 will turn on, this will draw current through the four LEDs illuminating D8.
D33	Diode D33 is an LED bar that actually consists of four LEDs in a single package (same as D8). When the SEG_DP line from IC15 is brought high, and the DIG1_1-DIG1_4 lines are brought low diode D33 will illuminate.

5.2.16 Audio Drive Circuitry

The audio in the Model 515B/C is both frequency and volume adjusted, see page 4 on schematic. The speaker LS1 is driven by audio amplifier IC16, volume is controlled by a digital potentiometer IC33, located in the feedback loop. The digital potentiometer is controlled by the AUD_INC* line and address line A0. When the TONECS* line from IC11 (pin 12) and the WR* lines are brought low, the AUD_INC* line from IC9 pin 8 will be brought low. At this time, the state of the A0 line will determine if IC33 is incremented or decremented (high = incremented, low = decremented). When incremented the volume will increase, and when decremented the volume will decrease.

The tone frequency is controlled by IC32, a tone generator. When the TONE_CS line is brought high IC32 is written to by data lines D0-D5. The data on these lines will select the desired tone for amplification by the audio amp IC16.

5.2.17 Keypanel and Configuration Header

The processor continually scans the keypanel for a key depression, see page 2 on schematic. The keypanel inputs enter the board at J402, these inputs are tied high by pull up resistors R33-40. When a front panel key is pressed the appropriate line is brought low.

When a key is pressed the corresponding input to IC5 is brought to a logic low, this is then transferred to the appropriate output pin. When the RDKEY* line is brought low that signal is read by the processor's data lines. The configuration headers are read in the same manner. When activated, a jumper connects a TSW line to ground (either TSW1-TSW3). At power up these lines are read by the processor and the configuration, if any, is performed.[2]

5.2.18 Graphics Display

The Model 515C includes a graphic display for the plethysmogram, see page 2 on schematic. The display connects to the main board at J401. The following lines are used to communicate with the display:

A0	When high signals data in, when low signals instruction commands.
D0-D7	Data/command input lines
DISPCS1* DISPCS2*	Display chip enable lines. Each line enables 1/2 of the display.
RESET*	Reset line from the processor.
WR*	Write line from the processor.
E	Clock signal from the processor.
VLC	Contrast control voltage from Q16/IC34.

2721/2722 contrast circuit

The contrast is controlled by digital potentiometer IC34, and transistor Q16 (see page 4 on schematic). A voltage divider is set up by R121, IC34, and R122 from -VA to ground. The "wiper" position of IC34 is controlled by the CTRSTCS* and A0 lines. The voltage level at pin 5 is then varied and controls the bias on Q16. The output voltage at the emitter of Q16 (VLC) controls the contrast level of the display.

2723/2724 contrast circuit

The contrast is controlled by digital potentiometer IC34, and amplifier IC35 (see page 4 on schematic). A voltage divider is set up by R121, IC34, R122/R130 from the -V5 supply to ground. The "wiper" position of IC34 is controlled by the CTRSTCS* and A0 lines. The voltage level at pin 5 is then varied and this is reflected at the output of IC35 (VLC), controlling the contrast level of the display.

The backlight for the display on the 2723/2724 boards is pulsed rather than driven continuously in order to conserve energy. The circuitry is displayed on page 1 of the schematic. The Q8 and Q9 outputs from IC6 drive the input of OR gate IC8 pins 11, 12, 13. The output is then AC coupled to Q16 which turn on and off in a 75% duty cycle. When Q16 is biased on the backlight is on, when Q16 is biased off the backlight is off (R32 is not installed int he 2723/2724 boards).

2. The TSW1 configuration header will disable the audible alert muting if set, the remaining lines are for internal Novametrix use.

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6 Maintenance

This section contains maintenance information for the Model 515B/C monitor and accessories.

6.1 *Cleaning and Sterilization*

Follow the cleaning and sterilization instructions listed below to clean and/or sterilize the monitor and its accessories.

6.1.1 Monitor

- Turn the monitor off and unplug the line cord from the AC mains before cleaning.
- Clean the monitor surface with a damp cloth.
- Do not immerse the monitor.
- Do not attempt to sterilize the monitor.

6.1.2 SpO_2 Finger Sensor

- Clean the finger sensor surfaces with a damp cloth.
- Ensure that the finger sensor windows are clean and dry before reuse.
- Do not immerse the finger sensor.
- Do not attempt to sterilize the finger sensor.
- Perform a “Quick Check” to verify the integrity of the sensor. See User’s Manual.

6.1.3 SpO_2 Y-Sensor

- The Y-Sensor may be immersed (up to the connectors) in a cold liquid sterilant (e.g. Cidex™). Refer to sterilant manufacturer’s instructions and standard hospital protocol.
- Clean the Y-Sensor surfaces with a damp cloth.
- Rinse thoroughly with water and dry before use.
- Do not attempt to sterilize Y-Sensor except as stated above.
- Do not immerse connectors on the Y-Sensor.
- Perform a “Quick Check” to verify the integrity of the sensor. See User’s Manual.

6.1.4 Y-Strip Tapes and Foam Wraps

- Treat Y-Strip tapes and foam wraps in accordance with hospital protocol for single-patient use.

6.1.5 Ear Clips

- Clean the ear clip with a damp cloth.
- Do not immerse the ear clip.

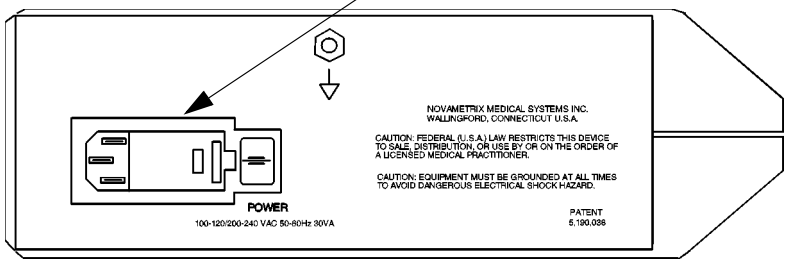
6.2 *Battery Maintenance*

If the monitor has not been used or powered by AC mains for an extended time (3 months or more) allow the battery to charge overnight before use. To charge the battery connect the AC mains and set the rear panel power switch ON (|). Check that the front panel battery icon is green. This will ensure a fully charged battery in the event battery power is desired. See “Assembly Exchanges” on page 29 for instructions on battery replacement.

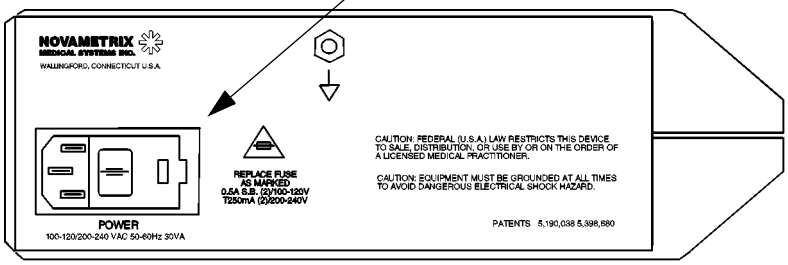
6.3 *Replacing AC Mains Fuses*

Depending upon which power supply assembly is installed in the monitor, replacing the fuses and adjusting the mains supply voltage will differ. Determine which assembly is installed then follow the appropriate instructions.

EARLIER POWER ENTRY MODULE


NOVAMETRIX MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
POWER
100-120/200-240 VAC 50-60Hz 30VA
PATENT
5,190,038

NEWER POWER ENTRY MODULE

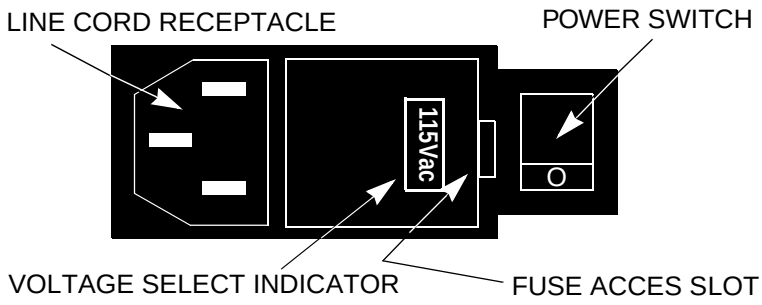

NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
REPLACE FUSE
AS MARKED
0.5A S.B. (5)100-120V
T250mA (2)200-240V
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
CAUTION: EQUIPMENT MUST BE GROUNDED AT ALL TIMES TO AVOID DANGEROUS ELECTRICAL SHOCK HAZARD.
POWER
100-120/200-240 VAC 50-60Hz 30VA
PATENTS 5,190,038 5,398,680

⚠ **CAUTION: Replace fuses with same type and rating. Verify proper fuse value for mains voltage setting (see table below).**

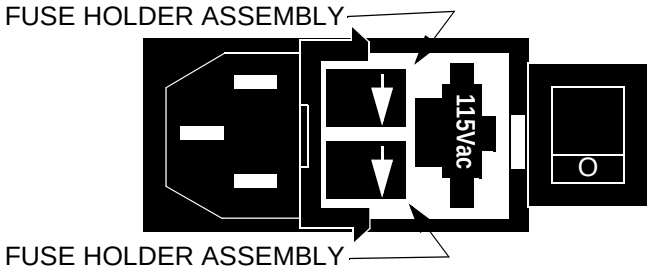
Mains Voltage	Fuses (Slo Blo)	Part Number
100-120 VAC	0.5 A 250V	515023
200-240 VAC	250mA 250V	515033

6.3.1 Assemblies with the earlier Power Entry Modules

1. Turn off the monitor. Set the rear panel AC mains power switch to “0” and disconnect the line cord from the monitor.
2. Place a screwdriver into the fuse access slot and pry open the fuse access door.



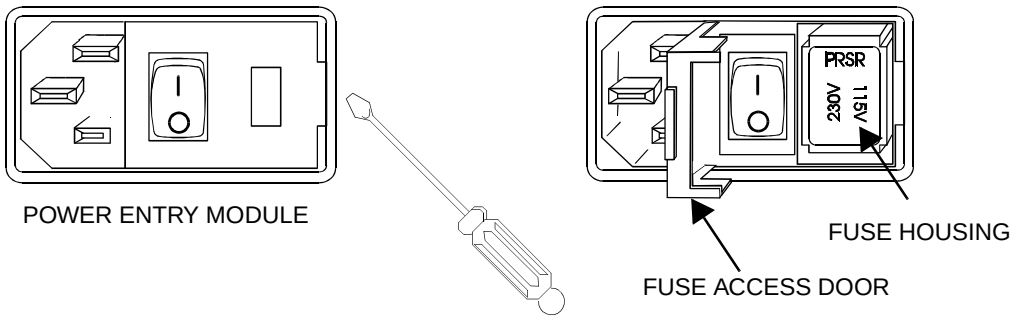
3. With the fuse access door open pull the fuse(s) out by pulling on the point of the arrow indicator, the fuse holder assembly will slide out.



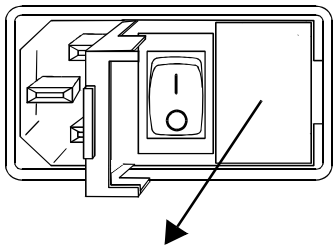
4. After replacing the fuse(s), snap the fuse-holder assemblies into the power entry module assembly and shut the fuse access door.

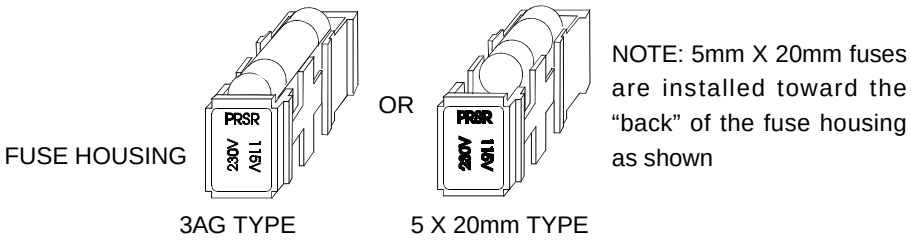
6.3.2 Assemblies with the newer Power Entry Module

1. Check that the monitor is OFF.
2. Set the rear panel power entry module switch to OFF (“O”). Remove the line cord from the power entry module (if connected).
3. Using a flat blade screwdriver, pry the fuse access door open to expose the fuse housing. Note the orientation of the fuse housing (this determines the mains operating voltage).

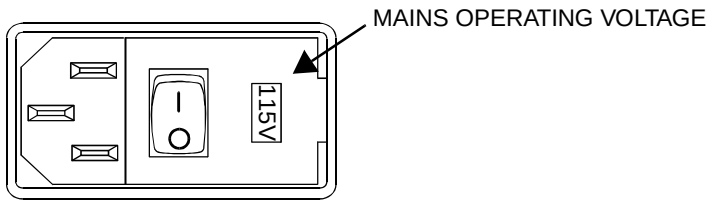


4. Pry the fuse housing out from the power entry module.





5. Replace the blown fuse(s) with the proper type and rating.
6. Re-install the fuse housing. When positioning the housing into the power entry module ensure that it is oriented correctly. Press the fuse housing back into the power entry module.
7. Close the fuse access door and verify the proper mains operating voltage is displayed.



6.4 *Changing AC Mains Voltage*

Depending upon which power supply assembly is installed in the monitor, replacing the fuses and adjusting the mains supply voltage will differ. Determine which assembly is installed then follow the appropriate instructions.

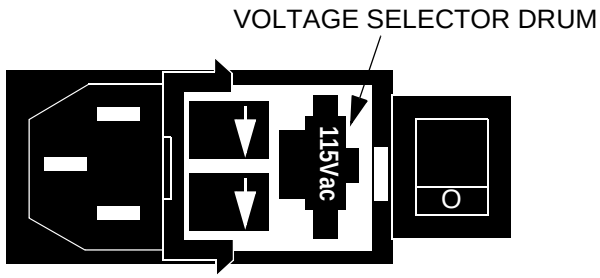
⚠ **CAUTION: Replace fuses with same type and rating. Verify proper fuse value for mains voltage setting (see table below).**

Mains Voltage	Fuses (Slo Blo)	Part Number
100-120 VAC	0.5 A 250V	515023
200-240 VAC	250mA 250V	515033

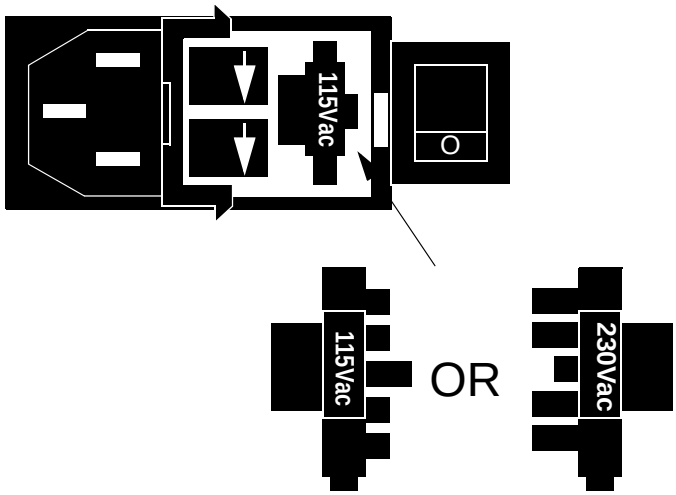
6.4.1 Assemblies with the earlier Power Entry Module

1. Turn off the monitor. Set the rear panel AC mains power switch to "0" and disconnect the line cord from the monitor.
2. Place a screwdriver into the fuse access slot and pry open the fuse access door.

3. Using needle-nosed pliers, pull the voltage selector drum from the power entry module. Note the orientation of the drum; the proper voltage should face out.



4. Set the voltage selector drum so that the printed side of the correct voltage faces you. The voltage selections are pictured below.

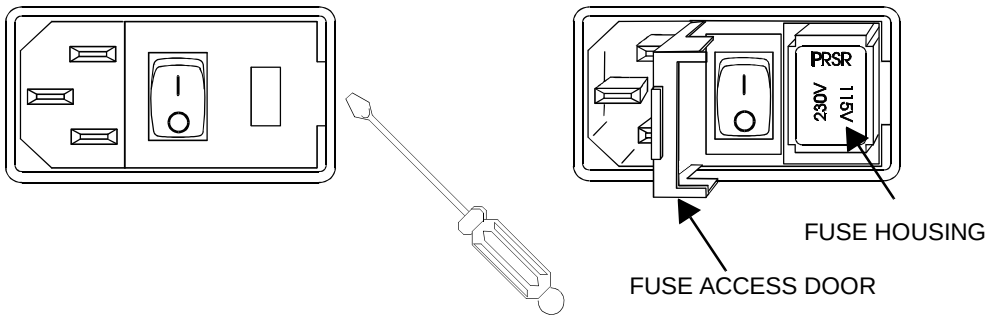


5. Snap the voltage selector drum back into the power entry module. Be sure that the voltage setting Indicator shows the proper voltage. Close the fuse access door.

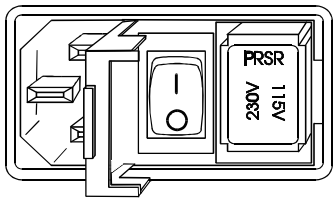
6.4.2 Assemblies with the newer Power Entry Module

1. Check that the monitor is OFF.
2. Set the rear panel power entry module switch to OFF (“O”). Remove the line cord from the power entry module (if connected).

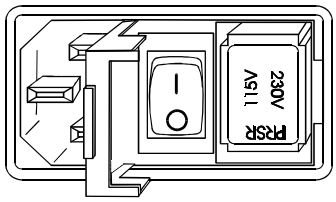
3. Using a flat blade screwdriver, pry the fuse access door open to expose the fuse housing. Pry the fuse housing out from the power entry module.



4. Install the proper type and rating fuse for the mains voltage setting required.
5. Position the housing into the power entry module so that the desired voltage is furthest away from the switch (see below).

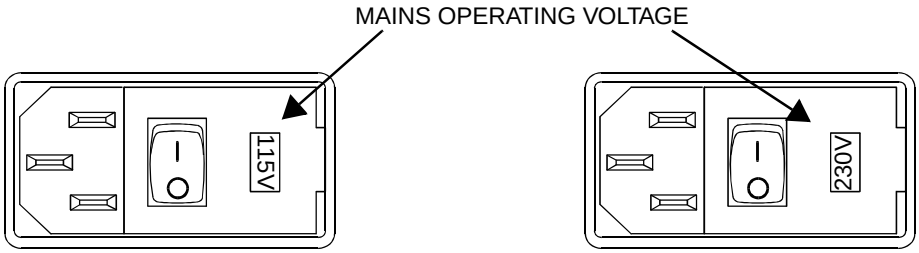


SET FOR 100-120V OPERATION



SET FOR 200-240V OPERATION

6. Close the fuse access door and verify the proper mains operating voltage is displayed.



6.5 *Assembly Exchanges*

Disassembly should be performed by qualified service personnel only. Follow proper grounding precautions to avoid damage to internal components from static discharge.

6.5.1 Internal Assemblies

1. Ensure that the monitor is OFF. Disconnect the line cord and sensor. Turn the monitor upside down and remove the four cover screws from the bottom cover. Holding both case halves together, flip the monitor right-side up.
2. Carefully lift the top cover from the monitor (use a gentle rocking motion to lift first one side and then the other side a little at a time). Set the red alert lens aside along with the top cover for safe keeping.
3. The separate assemblies of the monitor can now be removed.

6.5.2 Main Board/Keypanel Assembly

1. Unplug the power cable from J404 on the main board. Disconnect the sensor cable from J403 on the main board.
2. The main board/keypanel assembly can then be lifted from the bottom case assembly.

6.5.3 Power supply assembly

1. Unplug the power cable from J302 on the power supply board. The power supply/ rearpanel assembly can then be lifted from the bottom case assembly.

6.5.4 Replacing the internal battery

1. Unplug the power cable from J404 on the main board. Disconnect the positive and negative leads from the battery.
2. Slide the battery bracket out from the bottom cover assembly.
3. Remove the old battery and replace with the new one.

   Some batteries may be secured to the battery shield with double sided tape. This is placed in between the shield and the bottom of the battery. To remove, work the battery back and forth to loosen the grip of the tape, then pull the battery out.
4. Replace the battery bracket. Reconnect the positive (red) and negative (black) leads to the battery. Reconnect J404 on the main board.

6.6 *Changing System Software*

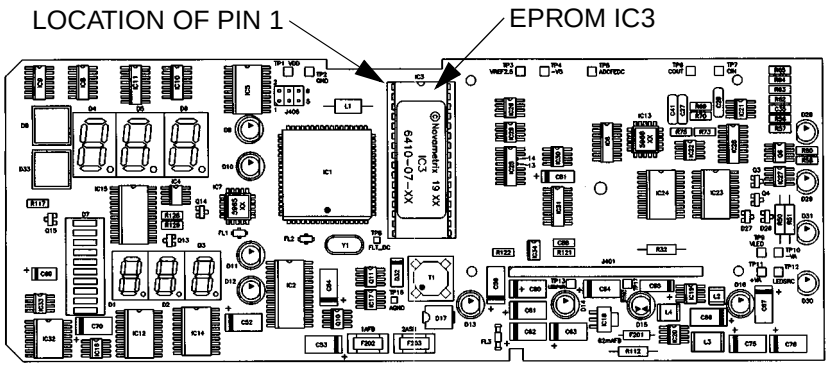
New software releases may be made available from time to time. These new releases may add features or be maintenance upgrades. The system software is contained in EPROM IC3 on the main board.

Be sure to observe proper grounding procedures to avoid possible damage to electronic circuits from static discharge.

To install a new EPROM:

1. Follow the steps listed in “Assembly Exchanges” on page 29 to remove the main board and keypanel assemblies. Be sure to disconnect the power cable from J404 on the main board to ensure that power is removed from the board.

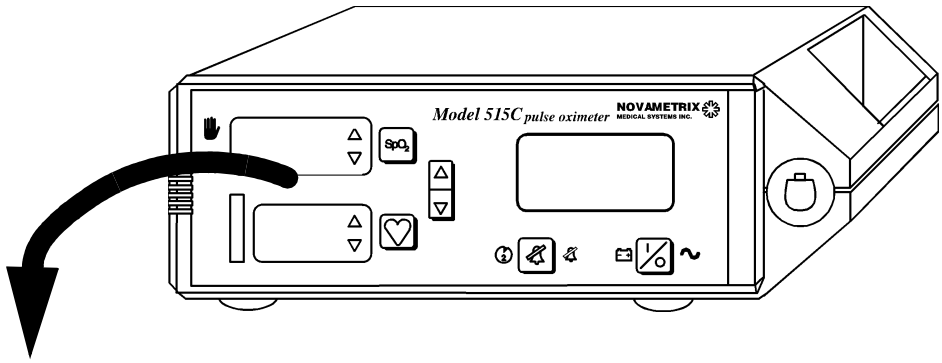
2. Disconnect the keypanel from the main board, set aside in a safe place.
3. Use a small flat blade screwdriver, or an IC extraction tool to pry the EPROM from its socket. Be careful not to bend any pins.

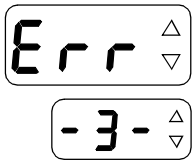


4. Install the new EPROM in the socket. Be sure to align pin 1 of the new EPROM with pin 1 of the socket. Check that all the pins are inserted properly into the socket.
5. Reassemble the monitor.
   NOTE: Hold the main board and keypanel assemblies together when inserting into the bottom half of the case.

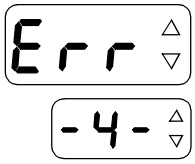
7 Troubleshooting

Certain conditions may evoke special messages in the saturation and pulse rate displays. These displays and the conditions are listed below. Note that “Err” stands for error, but does not necessarily indicate a malfunction. Also, error conditions one and two are internal only, and are not displayed.

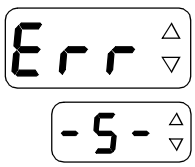




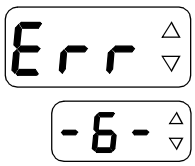
Low signal strength. Pulse strength as detected by the sensor is too small for proper monitor operation. This message will disappear once the problem is corrected.



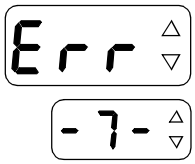
Insufficient light. Sensor is placed on a site too thick (or opaque) for adequate light transmission. This message will disappear once the problem is corrected.



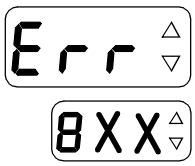
Pulse out of range. Pulse must be within 30 -250 beats per minute inclusive. This message will disappear once the problem is corrected.



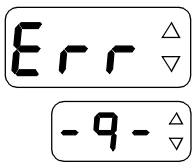
Light interference. Ambient light source (sunlight, warming lights, etc.) are interfering with sensor operation. Shield sensor from these light sources. This message will disappear once the problem is corrected.



Sensor fault. Remove sensor from use and contact qualified service personnel.



Monitor fault. Record the error number that appears in the pulse rate display (XX will vary, depending upon the fault). Remove the monitor from use and contact qualified service personnel (report the number that appears in the pulse rate display).



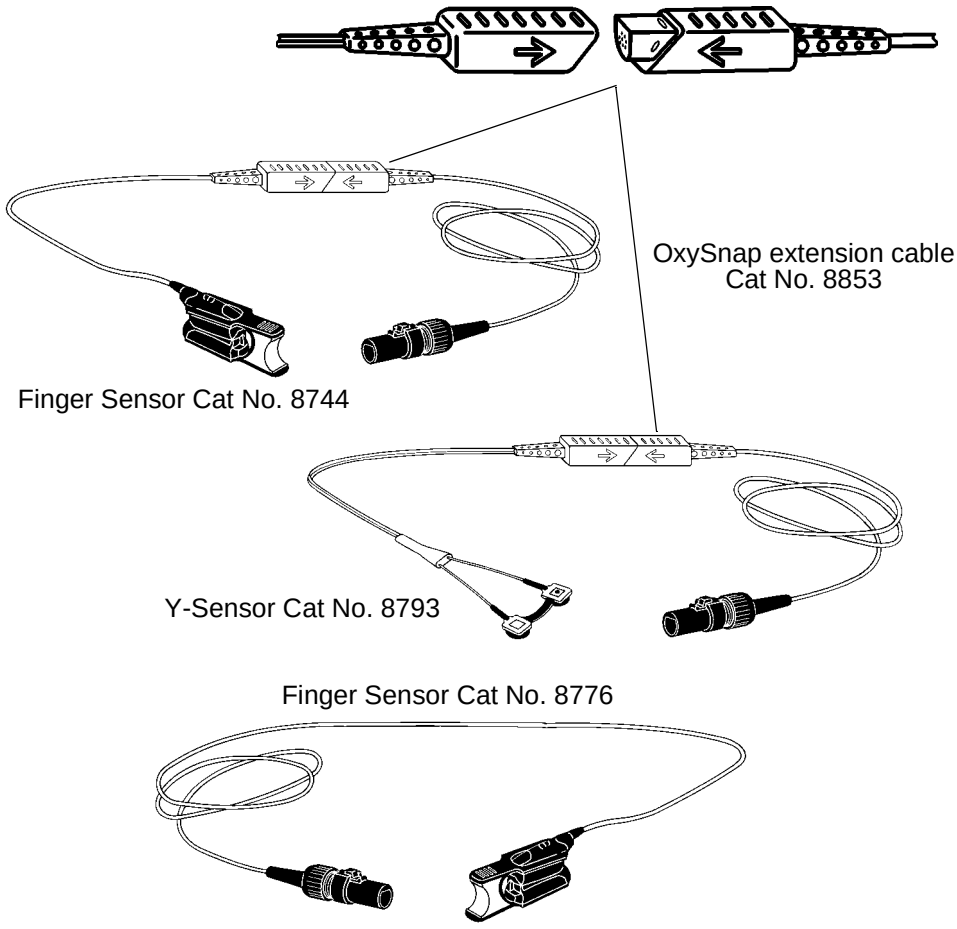
Bad Signal. Monitor not receiving valid signals from sensor. May be caused by excessive motion, cardiac arrhythmia or other situations leading to poor signal. Check patient status, reposition sensor. This message will disappear once the problem is corrected.

8 Functional Test

The functional tests verify the overall functional integrity of the monitor and sensor. If the monitor and sensor do not pass these tests, remove from use and contact the Novametrix Service Department for repair/replacement assistance.

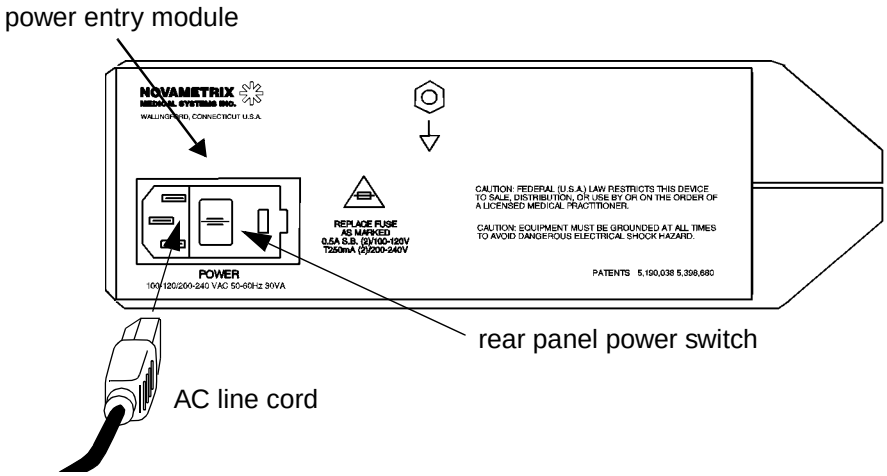
8.1 *Equipment required*

- Line cord (supplied with unit) PN: 600026
- SuperBright™ Sensor (Finger sensor-PN: 8744, or Y-Sensor-PN: 8793) with *OxySnap*™ extension cable-PN: 8853 (8 ft), 8898 (12 ft), or SuperBright™ Sensor (Finger sensor-8776, or Y-Sensor-PN: 8791).
  If using the Y-Sensor it is recommended that one of the Y-Strip tapes be used also. This will facilitate easy application of the sensor for testing purposes.



8.2 *Functional Test*

1. With the unit off, plug the line cord to the rear panel power entry module, then into an unswitched three prong hospital grade plug.


power entry module
NOVAMETRIX
MEDICAL SYSTEMS INC.
WALLINGFORD, CONNECTICUT U.S.A.
CAUTION: FEDERAL (U.S.A.) LAW RESTRICTS THIS DEVICE TO SALE, DISTRIBUTION, OR USE BY OR ON THE ORDER OF A LICENSED MEDICAL PRACTITIONER.
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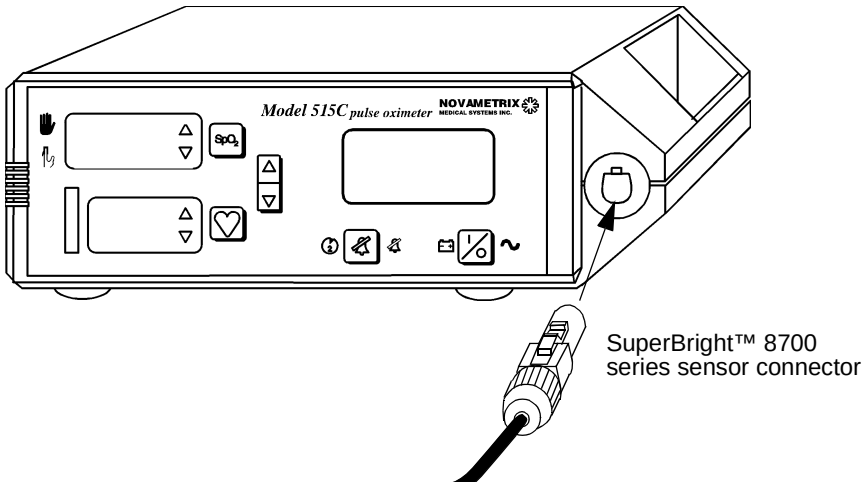
REPLACE FUSE AS MARKED 0.5A S.B. (2)/100-120V T250mA (2)/200-240V
POWER
100/120/200-240 VAC 50-60Hz 30VA
PATENTS 5,190,038 5,398,680
rear panel power switch
AC line cord

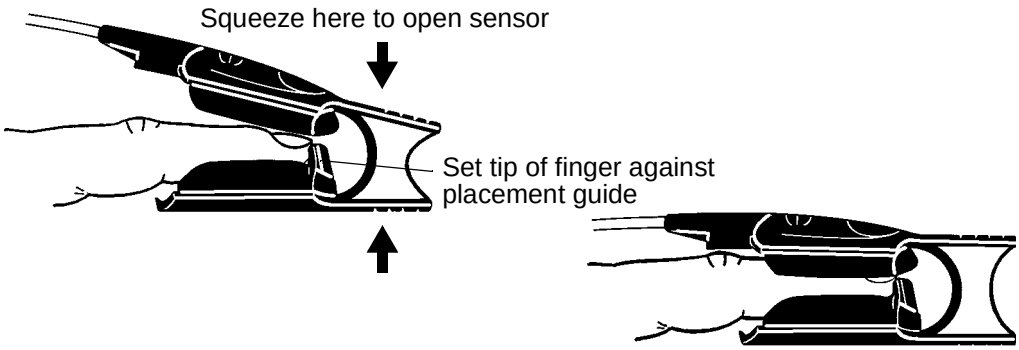
2. Set the rear panel power switch to "|" (ON).
3. Check that the front panel ∿ icon illuminates green.
4. Turn the monitor on by pressing the ⏻ key. Check that the monitor powers up:
   An audible series of beeps will be produced, all displays and LEDs will briefly illuminate, then the revision level will appear in the saturation display, and "515" will appear in the pulse rate display. The monitor will then enter normal operating mode.
5. Verify that the sensor icon illuminates red.
6. Attach the sensor, check that sensor icon flashes and the SpO_2 and pulse rate displays show "- - -".

   If using the Y-Sensor, hold the heads of the sensor so that they face each other (the red light shines at the detector).

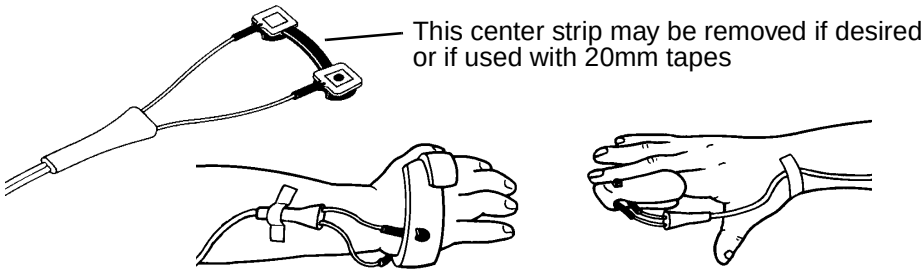


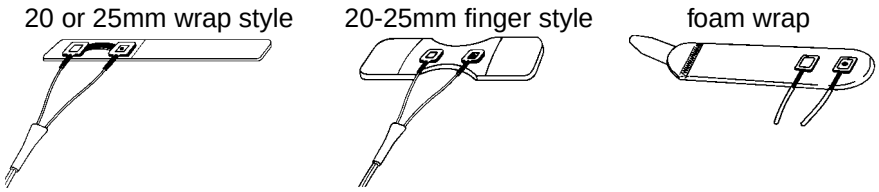
7. Apply the sensor:

   Finger sensor:



   Y-Sensor:





8. Check for reasonable SpO_2 and pulse rate values in the appropriate displays. Verify that the pulse bar pulses. On Model 515C, check for a plethysmogram waveform in the graphics display.

9. Press ▼, check that "PUL" appears in the SpO_2 display. Press ▲ and set the level, as displayed in the pulse rate display, to 4. Press the ♡ key to exit the pulse volume mode.

   The pulse beep volume level can be adjusted from level 0 (muted), to level 7 (loudest). If the ♡ key is not pressed then the monitor will automatically return to normal display mode after a ten second time out from when the last ▲ or ▼ key was pressed.

10. Verify a pulse beep in sync with the pulse bar (and plethysmogram on Model 515C).

11. Press and hold SpO_2 for three seconds, verify that the monitor beeps twice, then displays SpO_2 auto limits in the SpO_2 window.

    The upper limit will be displayed for three seconds while the ▲ icon is illuminated. Then the lower limit will be displayed for three seconds while the ▼ icon illuminates.

12. Press and hold ♡ for three seconds, verify that the monitor beeps twice, then displays Pulse Rate auto limits in the pulse rate window.

    The upper limit will be displayed for three seconds while the ▲ icon is illuminated. Then the lower limit will be displayed for three seconds while the ▼ icon illuminates.

13. Remove the sensor from yourself (do not unplug from the monitor), check that an alert sounds, and the alert bar flashes. Press 🔔, verify that the alert tone is muted, and the alert bar no longer flashes.

14. Reapply the sensor, check that SpO_2 and pulse rate values reappear.

15. Turn the rear panel power switch to “O” (OFF) to verify that the monitor will operate from battery power. Let the monitor run for a few minutes, check the color of the 🔋 icon.

    Green indicates that the battery is sufficiently charged to run the monitor. Orange indicates that the battery requires charging. Flashing red indicates that the battery is extremely weak and if battery operation is continued the monitor will turn itself off.

    If the 🔋 icon is flashing red the battery requires charging. Set the rear panel power switch to “|” (ON). Let the battery charge for 12 hours before use.

16. Press ⏻ to power the monitor down.

17. This completes the Model 515B/C and sensor functional test.

9 Electronic Tests

The electronic tests verify the operation of the electronic circuits within the Model 515B/C. These tests *DO NOT* need to be performed on a regular (preventative maintenance) basis. Perform these test only if the monitor fails to operate as expected and/or fails the "Functional Test" on page 33.

The electronic tests should be performed by qualified service personnel. The Model 515B/C contains static sensitive devices. Follow proper grounding precautions when handling the internal components to avoid damage from static discharge. See "Assembly Exchanges" on page 29 for disassembly of the monitor for these tests.

If the monitor does not pass the electronic tests, remove it from use and contact the Novametrix Service Department for repair/replacement assistance.

This procedure assumes the technician performs each step as indicated - leaving the monitor in a known state prior to performing the next step. If steps are omitted or performed out of order, be sure that the monitor is set to the correct state before continuing.

9.1 *Assembly Tests*

This procedure assumes the monitor is assembled with the exception of the top cover that has been removed.

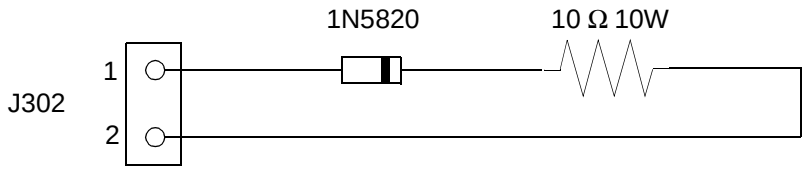
9.1.1 Equipment Required

- Line cord (supplied with unit) PN: 600026
- TB500B Sensor Simulator PN:5530-00
  This is the same device used by factory technicians to calibrate the monitor prior to shipping. If you own an earlier device, the TB500A, contact the Novametrix Service Department for details on upgrading to the TB500B. NOTE: The 5453-00 adapter cable must be used in conjunction with the 5977-00 adapter cable if using the TB500A.
- 100Ω 10 Watt resistor (for power supply testing)
- 10Ω 10 Watt resistor (for power supply testing)
- 1N5820 diode or equivalent (for power supply testing)
- Digital Volt Meter (DVM)*
- DC Power Supply*
  *Calibrated and NIST traceable

9.1.2 Power Supply

1. With the line cord disconnected from the monitor and the power switch set to "0" remove the connector from J302 on the power supply board. Carefully remove the power supply/rear panel assembly from the unit.
2. Unplug the power cable from J404 on the main board, this disconnects the battery. Measure the voltage across the battery leads, verify at least 11.5 volts DC.

3. Connect the line cord to the power entry module (power supply/rear panel assembly). *Be careful-line voltage is now present on the power supply/rear panel assembly.* Set the power switch to "|", measure the voltage at J302, verify 13.2 VDC (use the negative terminal of C1 as ground reference for all measurements).
4. Measure the voltage across the positive terminal of C1 (VIN), verify approximately 25 ± 2VDC.
5. Measure the voltage on pin 3 of E302 (LINEST) with the DVM, verify 5 ± 0.2 VDC.
6. Monitor the voltage at F302 (VBATT) with the DVM, attach the 100 Ω resistor across the terminals of J302. Verify the voltage is 14.1 ± 0.4 VDC. Disconnect the resistor.
7. Connect the anode of the diode to pin one of J302, then the 10 Ω resistor between the cathode and pin 2 of J302 (see below). Verify that the voltage oscillates, this checks the current limit circuitry.



8. Disconnect the diode/resistor from J302.
9. Set the power switch off "0", remove the line cord from the power entry module. Reinstall the power supply/rear panel assembly, connect the power cable to J302 on the power supply board, reconnect the power cable to J404 on the 2721 or 2722 main board/keypanel assembly.
   NOTE: Be sure all connections are oriented properly to avoid damage to the unit.
10. Disconnect the positive terminal (red) from the battery. Carefully set the cable aside so as not to accidentally come into contact with any conductive surfaces or boards inside the monitor.
11. Reconnect the line cord and place the power switch to the ON "|" position. Verify the ∿ icon on the front panel illuminates.
12. Carefully lift the main board/keypanel assembly from the bottom cover to separate the keypanel from the main board. This is to expose test points on the 2721/2722 main board for voltage measurements.
13. Use TP2 GND as reference, measure the voltage at F202, verify +13 to +14 VDC.
14. Set the rear panel power switch to OFF "O", then remove the line cord.
15. Reconnect the battery to the power cable.

9.1.3 Main Board

This procedure assumes the monitor is assembled with the exception of the top cover that has been removed.

1. Attach the line cord to the monitor, set the rear panel power switch ON "|". Verify the ∿ icon on the front panel is green.
2. Carefully lift the main board/keypanel assembly from the bottom cover to separate the keypanel from the main board. This is to expose test points on the main board for voltage measurements.

3. Press ⏻ to turn the monitor on.
4. Monitor pin 6 of IC19, check for sync pulses. Check that the pulse amplitude is above 50mv (best to AC couple the oscilloscope).
5. Verify the following voltages, use TP16 AGND as reference:

TP1 VDD	+4.90 - 5.10 VDC
TP4 -V5	-4.88 - (-)5.12 VDC
TP11 +VA	+8.88 - 9.22 VDC
TP10 -VA*	negative value of +VA w/-550mv tolerance
TP12 LEDSRC*	positive value of +VA w/-2.5 volt tolerance (no sensor connected)
TP13 LEDPWR	+8.88 - 9.22 VDC (no sensor connected)
TP3 VREF2.5	+2.5 VDC (1mv tolerance)

*These voltages are based on the +VA supply value with the listed tolerance.

6. Situate the keypanel so as to gain easy access to the keys without stressing the ribbon cable. Check that finger sensor icon is illuminated (probe not connected).
7. Connect the TB500B. Set as follows:

SENSOR TYPE:	87XX
POWER ON:	ON
ATTENUATION:	3
SATURATION:	92

8. Verify a Pulse Rate of 59-61 and Saturation value of 90-94. Finger sensor and hand icons should be off.
9. Adjust pulse beep volume using up/down arrows on keypanel. Verify the volume increases and decreases.
10. Set TB500B SATURATION to 62, verify the alert bar flashes and alarm tone sounds. Press 🔔, verify the alert tone mutes and the (2) icon flashes.
11. Set TB500B SATURATION to 92, verify Saturation display updates and alert bar stops flashing.
12. Press and hold the 🔔 button until the 🔔 LED illuminates.
13. Verify the following SpO_2 values on the monitor for each of the SIGNAL ATTENUATION and SATURATION settings on the TB500B Sensor Simulator. Note that the pulse rate should remain stable at 50-61 beats per minute.

SAT. SETTING	SIGNAL ATTEN.	Monitor's SpO_2 display TB500A	TB500B
100	3	98-100	98-100
92	3	90-94	90-94
82	3	82-86	80-84
72	3	75-79	70-74

SAT. SETTING	SIGNAL ATTEN.	Monitor's SpO_2 display TB500A	TB500B
62	3	67-71	60-64
62	7	N/A	N/A
72	7	74-80	68-76
82	7	80-88	78-86
92	7	88-96	88-96
100	7	98-100	98-100

14. Set the SIG ATTEN to 1, verify that finger sensor icon and the alert bar flash (probe off patient indication).
15. Press and hold the **RED** button on the TB500B, verify "Err" appears in the saturation display, and "-7-" appears in the pulse rate display. Release the button.
16. Press and hold the **INFRARED** button on the TB500B, verify "Err" appears in the saturation display, and "-7-" appears in the pulse rate display. Release the button.
17. Power down the board by pressing ⏻.
18. Disconnect the power supply at J404 on the main board. Set an external DC supply to +13.8 VDC. Attach the supply to J404, observe polarity (pin 3 is +, pin 4 is -).
19. Turn the board on by pressing ⏻. After the power up sequence check that the battery icon is green.
20. Adjust the external supply between 11.06 to 11.45 volts, verify the battery icon is now orange.
21. Adjust the external supply between 11.00 to 10.45 volts, verify the battery icon is flashing red.

9.2 *Accuracy Test*

The accuracy tests verifies the performance accuracy of the Model 515B/C Pulse Oximeter. This test uses the Model TB500B Sensor Simulator (available from Novametrix Service Dept.). This is the same device used by the factory technicians to calibrate the monitor prior to shipping. The TB500B is an updated version of the TB500A Test Box. Owners of the TB500A should contact Novametrix Service Department for details on upgrading to the TB500B. Note that the TB500A, used in conjunction with the 5453-00 adapter cable may be substituted for the TB500B in most parts of this test.

9.2.1 Equipment Required

- AC line cord (supplied with unit) PN: 600026
- TB500B Sensor Simulator (or TB500A, see note above) PN: 5530-00

9.2.2 Test

1. Attach the line cord to the monitor. Set the rear panel power switch ON "|". Check that the front panel ∿ icon is green.
2. Do not connect any sensor or the TB500B Sensor Simulator at this time.
3. Press the ⏻ key to turn the monitor on.
   A series of audible tones will occur.

Verify all the LEDs and segments briefly illuminate.
The software revision level will appear in the SpO_2 display, the model number “515” will appear in the pulse rate display.

4. Verify the is flashing and the SpO_2 and pulse rate windows display “- - -”.
5. Set the controls on the TB500B as follows:

POWER:	ON
SENSOR TYPE:	87XX
SIGNAL ATTENUATION:	3
SATURATION:	92

6. Plug the TB500B connector into the Model 515B/C SpO_2 input. Check that the pulse bar begins to pulse, and that SpO_2 and pulse rate values appear after a few seconds. Check for a plethysmogram on model 515C.
7. Check that the SpO_2 value is 90-94, and that the pulse rate is 59-61.
8. Set the SIGNAL ATTENUATION to 1, verify that the flashes and the SpO_2 and pulse rate windows display “- - -.” An alarm should sound, and the alert bar should flash.
9. Set the SIGNAL ATTENUATION to 3, verify the alarm is silenced and the alert bar no longer flashes. Check that the SpO_2 and pulse rate values reappear.
10. Press and hold the key until the illuminates (audible alert silence).
11. Verify the following SpO_2 values on the monitor for each of the SIGNAL ATTENUATION and SATURATION settings on the TB500B Sensor Simulator. Note that the pulse rate should remain stable at 50-61 beats per minute.

SAT. SETTING	SIGNAL ATTEN.	Monitor’s SpO_2 display TB500A	TB500B
100	3	98-100	98-100
92	3	90-94	90-94
82	3	82-86	80-84
72	3	75-79	70-74
62	3	67-71	60-64
62	7	N/A	N/A
72	7	74-80	68-76
82	7	80-88	78-86
92	7	88-96	88-96
100	7	98-100	98-100

12. Turn off then disconnect the TB500B. Turn the Model 515B/C off. This completes the accuracy test for the Model 515B/C.

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10 Specifications

Below are specifications for the Novametrix Model 515B/C Pulse Oximeter. These specifications are listed for informational purposes only, and are subject to change without notice.

10.1 *Pulse Oximeter*

10.1.1 Principle of Operation

- Red/Infrared absorbtion

10.1.2 SpO_2 (Oxygen Saturation)

- Range: 0-100%
- Accuracy: (for 1 standard deviation or 68% of sample distribution)
  ± 2% SpO_2 (for 80-100% SpO_2)
  unspecified for 0-79%
- Display Resolution: 1%
- Averaging: 8 seconds
- Audio: Pitch of pulse tone varies with SpO_2 value

10.1.3 Pulse Rate

- Range: 30-250 beats per minute (bpm)
- Accuracy: (1 standard deviation), ± 1% of full scale
- Display Resolution, 1 bpm
- Averaging time: 8 seconds

10.1.4 Sensors

- Reusable Y-Sensor™ (can be sterilized and used with all patient populations) and reusable adult finger sensor

10.1.5 Plethysmogram (Model 515C only)

- Pulsatile waveform

10.2 *General Specifications*

10.2.1 Alerts

- Limits: Automatic and adjustable limits for SpO_2 and Pulse Rate
- Audio: Adjustable volume, 2 min. silence or OFF (LED indicators)
- Visual: Flashing numerics upon violated limit(s) & red “Alert Bar” with limit (high or low) violation indicator

- Messages: Sensor disconnected, sensor off patient, low signal, insufficient light, high ambient light, pulse out of range, sensor faulty, monitor faulty.

10.2.2 Display

- Numerics: 7-Segment LED's
- Plethysmogram (Model 515C): Liquid crystal graphic module, 2.4"W X 1.3"H

10.2.3 Physical

- Operating Environment:
  10-40 °C (50-104° F)
  0-90% relative humidity (non-condensing)
- Weight: approximately 6 lbs. (2.72 kg)
- Dimensions:
  Height, 3.3 inches (8.38 cm)
  Width, 9 inches (22.86 cm)
  Depth, 8 inches (20.32 cm)

10.2.4 Electrical

- Power: 100-120/220-240 VAC ± 10%, 50-60 Hz, 30VA
- Fuse Rating:
  U.S. specification: 0.5 A, 250 V, Slo-Blo
  European specification: T 250 mA/250 V (x2)
- Battery:
  Sealed lead acid gel cell, 8 hr. life, 12 hr. recharge.
  Indicators for battery charging, battery operation, low battery, and extremely low battery.

11 Accesories

Model 515B/C PULSE OXIMETER

Catalog No.	Description
6500-00	Model 515B Pulse Oximeter
6550-00	Model 515C Pulse Oximeter with graphic display

SpO2 SENSORS and CABLES

8793	*OxySnap* Y-Sensor (use with *OxySnap* extension cable)
8744	*OxySnap* Finger Sensor (use with *OxySnap* extension cable)
8853	*OxySnap* Extension Cable, 8ft. (use with *OxySnap* sensors)
8898	*OxySnap* Long Extension Cable, 12 ft. (use with *OxySnap* sensors)
8894-00	*OxySnap* Connector Strap (25 per box)
4941	Saturation Sensor Extension Cable, 4 feet (use with non-*OxySnap* sensors)
4942	Saturation Sensor Extension Cable, 6 feet (use with non-*OxySnap* sensors)
4943	Saturation Sensor Extension Cable, 10 feet (use with non-*OxySnap* sensors)
5266	Saturation Sensor Extension Cable, 25 feet (use with non-*OxySnap* sensors)
8776	SuperBright™ Finger Sensor
8791	SuperBright™ Y-Sensor
8789	Special use SuperBright™ Finger Sensor (8 inch sensor cable)
5238	Special Use SuperBright™ Finger Sensor & 25 ft. shielded cable

OxySnap SENSOR MANAGEMENT PLANS

Select an *OxySnap* Finger Sensor or Y-Sensor Management Plan for each SuperBright™ Pulse Oximeter. The plan you select determines the warranty period - 12, 24 or 36 months.
How the plans work: Included in each plan are TWO sensors - one for immediate use, the other one for backup. If a sensor becomes inoperative, place the backup sensor into use and return the inoperative sensor in the convenient prepaid mailer. A replacement sensor will be shipped within two business days of receipt of the inoperative sensor. This simple return/replacement method will be used for the entire warranty period, thereby guaranteeing your costs and virtually eliminating sensor tracking hassles.
Warranty: The plan warranty (not individual sensors) is 12, 24 or 36 months. Replacement sensors provided under terms of the plan shall carry the remaining plan warranty - replacements do not extend the warranty.

8793-12	**Y-12 Plan:** The plan warranty is 12 months. Includes 3 boxes of any Y-Strip Taping Systems

Catalog No.	Description
8793-24	**Y-24 Plan:** The plan warranty is 24 months. Includes 6 boxes of any Y-Strip Taping Systems
8793-36	**Y-36 Plan:** The plan warranty is 36 months. Includes 9 boxes of any Y-Strip Taping Systems
8744-12	**Finger-12 Plan:** The plan warranty is 12 months.
8744-24	**Finger-24 Plan:** The plan warranty is 24 months.
8744-36	**Finger-36 Plan:** The plan warranty is 36 months.
Y-SENSOR APPLICATORS (tapes, wraps, earclip)	
8828	20mm Wrap Style Y-Strip Taping System (100 per box) Use on neonatal foot and hand, or on pediatric toe or finger, color coded blue.
8829	25mm Wrap Style Y-Strip Taping System (100 per box) Use on neonatal foot and hand, color coded green
8831	20mm Finger Style Y-Strip Taping System (100 per box) Use on pediatric finger or on small adult finger, color coded blue
8832	25mm Finger Style Y-Strip Taping System (100 per box) Use on adult finger, color coded green
8836	Non-Adhesive Foam Wraps (25 per box)
6131-50	Ear Clip (Pkg of 5) Includes 10 adhesive dots
6131-25	Ear Clip (Pkg of 25) Includes 50 adhesive dots
8700-00	Adhesive dots (Pkg of 200) For use with ear clip
MOUNTING SYSTEMS	
140030	Wall Mount
140031	Wall Mount (less wall channel)
140032	Pivot Block Mount
140033	Transport Mount (without swivel head)
140034	Transport Mount (with swivel head)
140035	Countertop Mount (11 inch base)
140036	Countertop Mount (5 inch base)
140037	Portable Instrument Housing
140038	Rollstand

Catalog No.	Description
MISCELLANEOUS	
7106-10	Transport Pouch (for monitor)
7104-10	Side Accessory Pouch
6318-00	Kickstand Kit for Model 515B or 515C monitors
600026	Power cord (included with monitor)
REFERENCE CARDS	
6342-32	English
6436-32	Spanish
6435-32	French
6365-32	German
280022	13” chain, used to attach reference card to the monitor
EXTENDED WARRANTY	
	(Normal warranty on monitor - 1 year)
6500-81	Model 515B warranty extended an additional 1 year
6500-82	Model 515B warranty extended an additional 2 years
6550-81	Model 515C warranty extended an additional 1 year
6550-82	Model 515C warranty extended an additional 2 years
BIOMEDICAL SERVICE TRAINING & TEST KITS	
5530-00	TB500B SpO_2 Test Box
9999-96	“focus” Technical Training Seminars, Pulse Oximetry (1 day course)

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12 Parts Lists

Common Replacement Parts List

PART NO	DESCRIPTION
600026	LINE CORD, 7 1/2 FT, Hospital Grade Plug
400024	BATTERY, 12V, 1.9Amp Hour, Lead Acid
6380-27	MEMBRANE KEYPANEL, Model 515C
6375-27	MEMBRANE KEYPANEL, MOdel 515B
6407-01	TOP COVER Assy.
6408-01	BOTTOM COVER Assy
9621-16	LENS, Alert
515023	FUSE, 1/2A SB (for 100-120 VAC)
515033	FUSE, 1/4A SB (for 200-240 VAC)
515084	FUSE 2A, SB, SURFACE MOUNT
515086	FUSE 1A, SURFACE MOUNT

12.1 *Model 515C*

6550-00 Model 515C Pulse Oximeter w/Graphics Display

This list applies to the units with the 6376-01 rear panel assembly (2532 power supply board) and the 2722 main board.

PART NO	REV	QPA	DESCRIPTION
1003-32	03	1	LABEL, SERIAL NUMBER, 3.000 X.5000
1217-32	03	1	REPAIR LABEL
315032		1	LABEL,"120 VAC" 10 X 20 MM BLK LETTERS
4470-32	00	1	LABEL, CAUTION GROUNDING
600026		1	LINE CORD, AC, 7 1/2 FT, HOSP GR PLUG-BUS MAC
6550-01	00	1	MAIN ASSY,
9760-32	01	1	LABEL, FUSE RATING, 1/2A, SLO-BLO,

This list applies to the units with the 6487-01 rear panel assembly (2725 power supply board) and the 2724 main board.

LINE	PART NO	REV	QPA	DESCRIPTION
0001	1003-32	03	1	LABEL, SERIAL NUMBER, 3.000 X.5000
0002	1217-32	03	1	REPAIR LABEL
0003	4470-32	00	1	LABEL, CAUTION GROUNDING
0004	6550-01	03	1	MAIN ASSY, MODEL 515C
0010	4042-32	00	1	U L LABEL
0015	315032		1	LABEL,"120 VAC" 10 X 20 MM BLK LETTERS,YEL BA
0016	600026		1	LINE CORD, AC, 7 1/2 FT, HOSP GR PLUG-BUS MAC

6550-01-00 Main Assy

This list applies to the units with the 6376-01 rear panel assembly (2532 power supply board) and the 2722 main board.

PART NO	REV	QPA	DESCRIPTION
2722-01	00	1	MAIN BOARD ASSY,
286205		0	6-32 X 3/4 S.B.H. CAD PLATED
400024		1	BATTERY, 12V, 1.9 AMP HOUR, LEAD ACID
6376-01	00	1	REAR PANEL ASSY,
6380-27	00	1	MEMBRANE KEYPANEL,
6381-01	00	1	SPO2 INPUT CONNECTOR ASSEMBLY
6382-01	00	1	POWER HARNESS ASSY,
6407-01	00	1	TOP COVER ASSY,
6408-01	00	1	BOTTOM COVER ASSY,
9621-16	02	1	LENS, ALERT
9624-16	00	8	LED REFLECTOR
6429-10	00	1	BATTERY SUPPORT BRACKET

This list applies to the units with the 6487-01 rear panel assembly (2725 power supply board) and the 2724 main board.

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2724-01	01	1	MAIN BOARD ASSY, MODEL 515C
0005	6487-01	00	1	REAR PANEL ASSY, MODEL 515B & 515C
0006	6380-27	04	1	MEMBRANE KEYPANEL, MODEL 515C
0007	6381-01	00	1	CABLE ASSY, SPO2 INPUT, MODEL 515B & 515C
0008	6382-01	00	1	POWER HARNESS ASSY, MODEL 515B & 515C
0009	6407-01	00	1	TOP COVER ASSY, MODEL 515B & 515C
0010	6408-01	01	1	BOTTOM COVER ASSY, MODEL 515B & 515C
0011	6429-10	00	1	BRACKET, BATTERY SUPPORT, MODEL 515B & 515C
0012	9621-16	02	1	LENS, ALERT, MODEL 515
0013	9624-16	00	8	LED REFLECTOR, MODEL 515
0019	161095		0	TAPE, FOAM, 1.5W X.062T X 50FT L, BLK, PR SE
0020	286205		0	6-32 X 3/4 S.B.H. CAD PLATED
0021	400024		1	BATTERY, 12V DC, 2.3 AMP HOUR, LEAD ACID

2722-01 01 Main Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2722-03	01	0	SCHEMATIC, MAIN BOARD, MODEL 515C
0002	2722-04	00	0	TEST PROCEDURE, MAIN BOARD, MODEL 515C
0003	2721-17	01	1	MAIN BOARD SUBASSY, MODEL 515B & 515C
0004	6406-01	00	1	GRAPHICS DISPLAY ASSY, MODEL 515C
0005	6410-07	03	1	PROGRAM, EPROM ASSY, SPO2, 515B & 515C
0015	281204		0	SCREW, 2-56 X 3/16 L, PHILLIPS, STEEL, NICKEL
0016	285012		0	LOCK WASHER, NO. 2, INTERNAL TOOTH, STEEL, CA

2721-17 01 Main Board Subassy

PART NO	QPA	DESCRIPTION
130014	1	SPEAKER, 550 HZ,.5W, 2 IN. DIA, PC MOUNT

PART NO	QPA	DESCRIPTION
152066	1	CAPACITOR, 220UF, 63V, RADIAL, ELECTROLYTIC
152070	1	CAPACITOR, 1000UF, 10V, 20%, ELCTLT, RADIAL,
152086	1	CAPACITOR, 1000UF, 16V, 20%, AL, ELCTLYTC,.2
153058	1	CAPACITOR, 4700PF, 50V, 10%, X7R, CERAMIC, S
154062	3	CAPACITOR,.01UF, 50V, 10%, X7R, SURFACE MOUN
154065	3	CAP,.1UF, 63V,.2 (5MM) SP, POLYESTER FILM
154072	56	CAPACITOR,.1UF, 50V, 10%, X7R, CER CHIP, S M
154074	1	CAPACITOR, 1.5UF, 25VDC, 10%, TANT, SURFACE M
154079	4	CAPACITOR, 10UF, 16V, 10%, TANTALUM, SURFACE
154080	3	CAPACITOR, 47UF, 10VDC, 10%, TANTALUM, SURFAC
154082	2	CAPACITOR, 22PF, 100V, 10%, NPO, MLTILYR CERA
154084	1	CAPACITOR, 2700PF, 100V, 10%, X7R, MLTILYR CE
154085	2	CAPACITOR, 47PF, 100VDC, 5%, MLTILYR CER, SUR
154093	5	CAPACITOR, 68UF, 16VDC, 10%, TANTALUM, SURF M
154094	4	CAPACITOR, 47UF, 20VDC, 20%, TANTALUM, SURF M
180011	1	FERRITE BEAD, 22 AWG TCW WIRE THRU CORE, 1 TU
180019	1	INDUCTOR, 100UH, 10%, SURFACE MOUNT
180021	1	INDUCTOR, 20UH PARALLEL/80UH SERIES, SURFACE
180022	2	INDUCTOR, 10UH, 10%, SURFACE MOUNT
180029	2	INDUCTOR, 50MHZ CUT-OFF FREQUENCY, SURFACE MO
180030	1	INDUCTOR-CAP, 4700PF, 50VDC, 2A, 3 TERM, SURF
211414	1	CONNECTOR, 4 PIN, PLUG, FRICTION LOCK, PC MOU
211634	1	CONNECTOR, 6 PIN, HEADER, DUAL ROW,.100 SP,
211721	1	CONNECTOR, 7 PIN, HEADER,.079 SPACING, PC MO
211914	1	CONNECTOR, 9 PIN, HEADER, SIL,.100 SP, STRAI
212534	1	CONNECTOR, 20 PIN, RECEPTACLE, SIL,.100 SP,
212609	1	CONNECTOR, 24 PIN, HEADER,.100 SPACING, PC M
215059	1	SOCKET, 32 PIN, LOW PROFILE,.6 SPACING
215074	4	SOCKET, 4 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215075	6	SOCKET, 5 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215076	2	SOCKET, 10 PIN, SINGLE-IN-LINE,.100 SP, PC M
215077	2	SOCKET, 15 PIN, SINGLE-IN-LINE,.100 SP, PC M
230023	1	CRYSTAL, 12.288 MHZ, HC49S CASE
280222	8	SPACER, LED, FOR 3 LEADS,.25 DIA X.31 L, BL
470011	1	RESISTOR, 8.2 OHM, 1/4W, 10%, CARBON
472198	1	RESISTOR, 3.3 OHM, 1/4W, 1%, CARBON
472200	1	RESISTOR, 5.6 OHM, 1/4W, 1%
472274	1	RESISTOR, 26.7 OHM, 1/4W, 1%
474136	3	RESISTOR, 1K OHM, 1/8W, 1%, SURFACE MOUNT
474138	13	RESISTOR, 100 OHM, 1/8W, 1%, SURFACE MOUNT
474144	6	RESISTOR, 20.5K OHM, 1/8W, 1%, SURFACE MOUNT
474145	6	RESISTOR, 215 OHM, 1/8W, 1%, SURFACE MOUNT
474148	3	RESISTOR, 2.05K OHM, 1/8W, 1%, SURFACE MOUNT
474149	2	RESISTOR, 33.2K OHM, 1/8W, 1%, SURFACE MOUNT
474153	11	RESISTOR, 42.2K OHM, 1/8W, 1%, SURFACE MOUNT
474157	2	RESISTOR, 511 OHM, 1/8W, 1%, SURFACE MOUNT
474160	1	RESISTOR, 5.11K OHM, 1/8W, 1%, SURFACE MOUNT
474165	11	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166	38	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474172	12	RESISTOR, 10 OHM, 1/8W, 1%, SURFACE MOUNT
474175	3	RESISTOR, 3.92K OHM, 1/8W, 1%, SURFACE MOUNT
474178	1	RESISTOR, 825 OHM, 1/8W, 1%, SURFACE MOUNT

PART NO	QPA	DESCRIPTION
474182	1	RESISTOR, 150K OHM, 1/8W, 1%, SURFACE MOUNT
474185	1	RESISTOR, 150 OHM, 1/8W, 1%, SURFACE MOUNT
474186	4	RESISTOR, 15K OHM, 1/8W, 1%, SURFACE MOUNT
474209	4	RESISTOR, 2.67K OHM, 1/8W, 1%, 1206 STYLE, S
474210	1	RESISTOR, 56.2K OHM, 1/8W, 1%, 1206 STYLE, S
474211	1	RESISTOR, 49.9K OHM, 1/8W, 1%, 1206 STYLE, S
475045	2	E2 POTENTIOMETER, 10K OHM, 20%, SURFACE MOUNT
481546	10	DIODE, MMBD914L, SWITCHING, SURFACE MOUNT
481547	2	DIODE, BAT54, HOT CARRIER SCHOTTKY, SURFACE M
481549	1	DIODE, MBRS140T3, RECTIFIER, SURFACE MOUNT
481552	1	DIODE, MBRS340T3, SCHOTTKY, 40V, 3A, SURFACE
482586	1	LED LIGHT BAR, YELLOW,.36 X.35
482587	1	LED LIGHT BAR, RED,.35 X.35
482588	1	LED BAR GRAPH, 10 ELEMENT, RED, 1 X.400
482589	3	LED 7 SEGMENT DISPLAY, 10MM, BLACK SURFACE, R
482590	3	LED 7 SEGMENT DISPLAY, 14.2MM, BLACK SURFACE,
482591	2	LED, YELLOW,.100 SPACING
482592	1	LED, GREEN,.100 LEAD SPACING
482593	4	LED, RED,.100 SPACING
482594	1	LED, BICOLOR, RED & GREEN, 3 LEAD,.100 SPACI
482596	4	LED, HLMP-C100, RED,.100 SPACING, PC MOUNT
483018	2	TRANSISTOR, MMBT3906T, PNP, SURFACE MOUNT
484060	1	TRANSISTOR, MMBT3904T, NPN, SURFACE MOUNT
484541	1	VOLTAGE REGULATOR, LM317LD, +1.2V - +37V OUT,
484553	1	IC, TL5001CD, PULSE WIDTH MOD CONT, 8 PIN, S
484554	1	VOLTAGE REGULATOR, LT1054CS8, SW CAP, 8 PIN,
484557	1	VOLTAGE REGULATOR, LT1117CST-5, POS, 3 PIN, S
485532	8	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
485540	1	TRANSISTOR, SI9955DY, MOSFET, DUAL, N-CH ENH,
485546	2	TRANSISTOR, VN0605T, N-CHAN ENHANCEMENT MODE,
485547	2	TRANSISTOR, TPS1101D, P-CH ENHAN MODE MOSFET,
486041	1	IC, MAX7219CWG, DISPLAY DRIVER, 8 DIGIT, 24 P
486306	1	IC, MCM60L256AF10, 32K X 8 CMOS SRAM, 100NS
486319	1	IC, MC14020BD, 14-BIT BINARY COUNTER, SURF MO
486320	1	IC, SN74HC14D, HEX SCHMITT-TRIGGER INV, SURF
486321	1	IC, SN74HC138D, 3-LINE TO 8-LINE DECDR, SURF
486323	3	IC, SN74HC573DW, OCTAL D-TYPE LATCH W 3-ST OU
486324	1	IC, DG444DY, QUAD SPST CMOS ANALOG SW, SURF M
486329	2	IC, SN74HC32D, QUAD 2-IN. POS OR GATE, SURF M
486332	2	IC, AD7703BR, 20-BIT A TO D CONVERTER, SURFAC
486333	1	IC, HD64180RCP-6X, 8-BIT MPU, HI INT, 68 PIN
486334	1	IC, MC14051BD, 8-CH ANALOG MUX/DEMUX, 16 PIN,
486342	1	IC, PCD3311CTDS, MUSICAL-TONE GEN, 16 PIN, S
486790	1	IC, TLE2022CD, DUAL OP AMPLIFIER, H SPEED, LO
486794	1	IC, PM7524FS, 8-BIT D TO A CONV, 16 PIN, SURF
486795	1	IC, TLC549ID, 8-BIT A TO D CONV, SERIAL CONTR
486812	1	IC, AD780AR, 2.5 VOLTAGE REFERENCE, 8 PIN, S
487084	3	IC, OP-282GS, DUAL JFET OP AMP, L PWR, H SPD,
487098	1	IC, MAX705CSA, UPROCESSOR SPRVISORY CKT, S MN
487114	1	IC, MC34119D, AUDIO AMPLIFIER, L PWR, 8 PIN,
515074	1	FUSE, PIGTAIL, 1/16A, 125V, V FAST-ACTING, 1.
515083	1	FUSE W FUSEHOLDER, 1A, 125V, V FAST-ACTING, S

PART NO	QPA	DESCRIPTION
515085	1	FUSE W FUSEHOLDER, 2A, 125V, SLO-BLO, SUBMIN,
2721-02	1	FAB, MAIN BOARD, MODEL 515B AND 515C
5965-07	1	PROGRAM, PEEL ASSY, CSIO CONTROLLER, MODEL 51
5966-07	1	PROGRAM, PEEL ASSY, TIMING SEQUENCER, MODEL 5

2724-01 01 Main Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2723-17	01	1	MAIN BOARD SUBASSY, MODEL 515B & 515C
0002	2724-03	01	0	SCHEMATIC, MAIN BOARD, MODEL 515C
0003	2724-04	00	0	TEST PROCEDURE, MAIN BOARD, MODEL 515C
0004	6410-07	03	1	PROGRAM, EPROM ASSY, SPO2, 515B & 515C
0015	280029		0	SPACER # 2-56 THREADED, 3/16 OD X 3/8 LG
0016	281204		0	SCREW, 2-56 X 3/16 L, PHILLIPS, STEEL, NICKEL
0017	285012		0	LOCK WASHER, NO. 2, INTERNAL TOOTH, STEEL, CA
0018	482597		1	LCD DISPLAY, WITH LED BACKLIGHT AND CONNECTOR

12.2 *Model 515B*

6500-00-00 Model 515B Pulse Oximeter

This list applies to the units with the 6376-01 rear panel assembly (2532 power supply board) and the 2721 main board.

PART NO	REV	QPA	DESCRIPTION
1003-32	03	1	LABEL, SERIAL NUMBER, 3.000 X.5000
1217-32	03	1	REPAIR LABEL
315032		1	LABEL,"120 VAC" 10 X 20 MM BLK LETTERS
4470-32	00	1	LABEL, CAUTION GROUNDING
600026		1	LINE CORD, AC, 7 1/2 FT, HOSP GR PLUG-BUS MAC
6500-01	00	1	MAIN ASSY,
9760-32	01	1	LABEL, FUSE RATING, 1/2A, SLO-BLO,

This list applies to the units with the 6487-01 rear panel assembly (2725 power supply board) and the 2724 main board.

LINE	PART NO	REV	QPA	DESCRIPTION
0001	1003-32	03	1	LABEL, SERIAL NUMBER, 3.000 X.5000
0002	1217-32	03	1	REPAIR LABEL
0003	4470-32	00	1	LABEL, CAUTION GROUNDING
0004	6500-01	03	1	MAIN ASSY, MODEL 515B
0010	4042-32	00	1	U L LABEL
0015	315032		1	LABEL,"120 VAC" 10 X 20 MM BLK LETTERS,YEL BA
0016	600026		1	LINE CORD, AC, 7 1/2 FT, HOSP GR PLUG-BUS MAC

6500-01-00 Main Assy

This list applies to the units with the 6376-01 rear panel assembly (2532 power supply board) and the 2721 main board.

PART NO	REV	QPA	DESCRIPTION
2721-01	00	1	MAIN BOARD ASSY,
286205		0	6-32 X 3/4 S.B.H. CAD PLATED
400024		1	BATTERY, 12V, 1.9 AMP HOUR, LEAD ACID
6375-27	00	1	MEMBRANE KEYPANEL,
6376-01	00	1	REAR PANEL ASSY,
6381-01	00	1	SPO2 INPUT CONNECTOR ASSEMBLY
6382-01	00	1	POWER HARNESS ASSY,
6407-01	00	1	TOP COVER ASSY,
6408-01	00	1	BOTTOM COVER ASSY,
9621-16	02	1	LENS, ALERT
9624-16	00	8	LED REFLECTOR
6429-10	00	1	BATTERY SUPPORT BRACKET

This list applies to the units with the 6487-01 rear panel assembly (2725 power supply board) and the 2723 main board.

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2723-01	01	1	MAIN BOARD ASSY, MODEL 515B
0005	6487-01	00	1	REAR PANEL ASSY, MODEL 515B & 515C
0006	6375-27	04	1	MEMBRANE KEYPANEL, MODEL 515B
0007	6381-01	00	1	CABLE ASSY, SPO2 INPUT, MODEL 515B & 515C
0008	6382-01	00	1	POWER HARNESS ASSY, MODEL 515B & 515C
0009	6407-01	00	1	TOP COVER ASSY, MODEL 515B & 515C
0010	6408-01	01	1	BOTTOM COVER ASSY, MODEL 515B & 515C
0011	6429-10	00	1	BRACKET, BATTERY SUPPORT, MODEL 515B & 515C
0012	9621-16	02	1	LENS, ALERT, MODEL 515
0013	9624-16	00	8	LED REFLECTOR, MODEL 515
0019	161095		0	TAPE, FOAM, 1.5W X.062T X 50FT L, BLK, PR SE
0020	286205		0	6-32 X 3/4 S.B.H. CAD PLATED
0021	400024		1	BATTERY, 12V DC, 2.3 AMP HOUR, LEAD ACID

2721-01 01 Main Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2721-03	01	0	SCHEMATIC, MAIN BOARD, MODEL 515B
0002	2721-04	00	0	TEST PROCEDURE, MAIN BOARD, MODEL 515B
0003	2721-17	01	1	MAIN BOARD SUBASSY, MODEL 515B & 515C
0004	6410-07	03	1	PROGRAM, EPROM ASSY, SPO2, 515B & 515C

2721-17-00 Main Board Subassy

PART NO	REV	QPA	DESCRIPTION
130014		1	SPEAKER, 550 HZ,.5W, 2 IN. DIA, PC MOUNT
152066		1	CAPACITOR, 220UF, 63V, RADIAL, ELECTROLYTIC
152070		1	CAPACITOR, 1000UF, 10V, 20%, ELCTLT, RADIAL,
152086		1	CAPACITOR, 1000UF, 16V, 20%, AL, ELCTLYTC,.2

PART NO	REV	QPA	DESCRIPTION
153058		1	CAPACITOR, 4700PF, 50V, 10%, X7R, CERAMIC, S
154062		3	CAPACITOR,.01UF, 50V, 10%, X7R, SURFACE MOUN
154065		3	CAP,.1UF, 63V,.2 (5MM) SP, POLYESTER FILM
154072		56	CAPACITOR,.1UF, 50V, 10%, X7R, CER CHIP, S M
154074		1	CAPACITOR, 1.5UF, 25VDC, 10%, TANT, SURFACE M
154079		4	CAPACITOR, 10UF, 16V, 10%, TANTALUM, SURFACE
154080		3	CAPACITOR, 47UF, 10VDC, 10%, TANTALUM, SURFAC
154082		2	CAPACITOR, 22PF, 100V, 10%, NPO, MLTILYR CERA
154084		1	CAPACITOR, 2700PF, 100V, 10%, X7R, MLTILYR CE
154085		2	CAPACITOR, 47PF, 100VDC, 5%, MLTILYR CER, SUR
154093		5	CAPACITOR, 68UF, 16VDC, 10%, TANTALUM, SURF M
154094		4	CAPACITOR, 47UF, 20VDC, 20%, TANTALUM, SURF M
180011		1	FERRITE BEAD, 22 AWG TCW WIRE THRU CORE, 1 TU
180019		1	INDUCTOR, 100UH, 10%, SURFACE MOUNT
180021		1	INDUCTOR, 20UH PARALLEL/80UH SERIES, SURFACE
180022		2	INDUCTOR, 10UH, 10%, SURFACE MOUNT
180029		2	INDUCTOR, 50MHZ CUT-OFF FREQUENCY, SURFACE MO
180030		1	INDUCTOR-CAP, 4700PF, 50VDC, 2A, 3 TERM, SURF
211414		1	CONNECTOR, 4 PIN, PLUG, FRICTION LOCK, PC MOU
211634		1	CONNECTOR, 6 PIN, HEADER, DUAL ROW,.100 SP,
211721		1	CONNECTOR, 7 PIN, HEADER,.079 SPACING, PC MO
211914		1	CONNECTOR, 9 PIN, HEADER, SIL,.100 SP, STRAI
212609		1	CONNECTOR, 24 PIN, HEADER,.100 SPACING, PC M
215059		1	SOCKET, 32 PIN, LOW PROFILE,.6 SPACING
215074		4	SOCKET, 4 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215075		6	SOCKET, 5 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215076		2	SOCKET, 10 PIN, SINGLE-IN-LINE,.100 SP, PC M
215077		2	SOCKET, 15 PIN, SINGLE-IN-LINE,.100 SP, PC M
230023		1	CRYSTAL, 12.288 MHZ, HC49S CASE
280222		8	SPACER, LED, FOR 3 LEADS,.25 DIA X.31 L, BL
472198		1	RESISTOR, 3.3 OHM, 1/4W, 1%, CARBON
472200		1	RESISTOR, 5.6 OHM, 1/4W, 1%
472274		1	RESISTOR, 26.7 OHM, 1/4W, 1%
474136		3	RESISTOR, 1K OHM, 1/8W, 1%, SURFACE MOUNT
474138		13	RESISTOR, 100 OHM, 1/8W, 1%, SURFACE MOUNT
474144		6	RESISTOR, 20.5K OHM, 1/8W, 1%, SURFACE MOUNT
474145		6	RESISTOR, 215 OHM, 1/8W, 1%, SURFACE MOUNT
474148		2	RESISTOR, 2.05K OHM, 1/8W, 1%, SURFACE MOUNT
474149		2	RESISTOR, 33.2K OHM, 1/8W, 1%, SURFACE MOUNT
474153		11	RESISTOR, 42.2K OHM, 1/8W, 1%, SURFACE MOUNT
474157		2	RESISTOR, 511 OHM, 1/8W, 1%, SURFACE MOUNT
474160		1	RESISTOR, 5.11K OHM, 1/8W, 1%, SURFACE MOUNT
474165		10	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166		38	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474172		12	RESISTOR, 10 OHM, 1/8W, 1%, SURFACE MOUNT
474175		3	RESISTOR, 3.92K OHM, 1/8W, 1%, SURFACE MOUNT
474178		1	RESISTOR, 825 OHM, 1/8W, 1%, SURFACE MOUNT
474182		1	RESISTOR, 150K OHM, 1/8W, 1%, SURFACE MOUNT
474185		1	RESISTOR, 150 OHM, 1/8W, 1%, SURFACE MOUNT
474186		4	RESISTOR, 15K OHM, 1/8W, 1%, SURFACE MOUNT
474209		4	RESISTOR, 2.67K OHM, 1/8W, 1%, 1206 STYLE, S
474210		1	RESISTOR, 56.2K OHM, 1/8W, 1%, 1206 STYLE, S

PART NO	REV	QPA	DESCRIPTION
474211		1	RESISTOR, 49.9K OHM, 1/8W, 1%, 1206 STYLE, S
475045		1	E2 POTENTIOMETER, 10K OHM, 20%, SURFACE MOUNT
481546		10	DIODE, MMBD914L, SWITCHING, SURFACE MOUNT
481547		2	DIODE, MMBD301L, HOT CARRIER SCHOTTKY, SURF M
481549		1	DIODE, MBRS140T3, RECTIFIER, SURFACE MOUNT
481552		1	DIODE, MBRS340T3, SCHOTTKY, 40V, 3A, SURFACE
482565		4	LED, CLEAR, ROUND
482586		1	LED LIGHT BAR, YELLOW,.36 X.35
482587		1	LED LIGHT BAR, RED,.35 X.35
482588		1	LED BAR GRAPH, 10 ELEMENT, RED, 1 X.400
482589		3	LED 7 SEGMENT DISPLAY, 10MM, BLACK SURFACE, R
482590		3	LED 7 SEGMENT DISPLAY, 14.2MM, BLACK SURFACE,
482591		2	LED, YELLOW,.100 SPACING
482592		1	LED, GREEN,.100 LEAD SPACING
482593		4	LED, RED,.100 SPACING
482594		1	LED, BICOLOR, RED & GREEN, 3 LEAD,.100 SPACI
483018		1	TRANSISTOR, MMBT3906T, PNP, SURFACE MOUNT
484060		1	TRANSISTOR, MMBT3904T, NPN, SURFACE MOUNT
484541		1	VOLTAGE REGULATOR, LM317LD, +1.2V - +37V OUT,
484553		1	IC, TL5001CD, PULSE WIDTH MOD CONT, 8 PIN, S
484554		1	VOLTAGE REGULATOR, LT1054CS8, SW CAP, 8 PIN,
484557		1	VOLTAGE REGULATOR, LT1117CST-5, POS, 3 PIN, S
485532		8	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
485540		1	TRANSISTOR, SI9955DY, MOSFET, DUAL, N-CH ENH,
485546		2	TRANSISTOR, VN0605T, N-CHAN ENHANCEMENT MODE,
485547		2	TRANSISTOR, TPS1101D, P-CH ENHAN MODE MOSFET,
486041		1	IC, MAX7219CWG, DISPLAY DRIVER, 8 DIGIT, 24 P
486306		1	IC, MCM60L256AF10, 32K X 8 CMOS SRAM, 100NS
486319		1	IC, MC14020BD, 14-BIT BINARY COUNTER, SURF MO
486320		1	IC, SN74HC14D, HEX SCHMITT-TRIGGER INV, SURF
486321		1	IC, SN74HC138D, 3-LINE TO 8-LINE DECDR, SURF
486323		3	IC, SN74HC573DW, OCTAL D-TYPE LATCH W 3-ST OU
486324		1	IC, DG444DY, QUAD SPST CMOS ANALOG SW, SURF M
486329		2	IC, SN74HC32D, QUAD 2-IN. POS OR GATE, SURF M
486332		2	IC, AD7703BR, 20-BIT A TO D CONVERTER, SURFAC
486333		1	IC, HD64180RCP-6X, 8-BIT MPU, HI INT, 68 PIN
486334		1	IC, MC14051BD, 8-CH ANALOG MUX/DEMUX, 16 PIN,
486342		1	IC, PCD3311CTDS, MUSICAL-TONE GEN, 16 PIN, S
486790		1	IC, TLE2022CD, DUAL HIGH SPEED LO PWR OP AMPL
486794		1	IC, PM7524FS, 8-BIT D TO A CONV, 16 PIN, SURF
486795		1	IC, TLC549ID, 8-BIT A TO D CONV, SERIAL CONTR
486812		1	IC, AD780AR, 2.5 VOLTAGE REFERENCE, 8 PIN, S
487084		3	IC, OP-282GS, DUAL JFET OP AMP, L PWR, H SPD,
487098		1	IC, MAX705CSA, UPROCESSOR SPRVISORY CKT, S MN
487114		1	IC, MC34119D, AUDIO AMPLIFIER, L PWR, 8 PIN,
515074		1	FUSE, 1/16A, 125V, VERY FAST-ACTING, SUBMIN,
515083		1	FUSE WITH FUSEHOLDER, 1A, 125V, SURFACE MOUNT
515085		1	FUSE WITH FUSEHOLDER, 2A, 125V, SLO-BLO, SURF
2721-02	00	1	FAB, MAIN BOARD,
5965-07	01	1	PROGRAM, PEEL ASSY, CSIO CONTROLLER, 51
5966-07	01	1	PROGRAM, PEEL ASSY, TIMING SEQUENCER, 5

2723-01 01 Main Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2723-03	01	0	SCHEMATIC, MAIN BOARD, MODEL 515B
0002	2723-04	00	0	TEST PROCEDURE, MAIN BOARD, MODEL 515B
0003	2723-17	01	1	MAIN BOARD SUBASSY, MODEL 515B & 515C
0004	6410-07	03	1	PROGRAM, EPROM ASSY, SPO2, 515B & 515C

2723-17 01 Main Board Subassy

PART NO	QPA	DESCRIPTION
130014	1	SPEAKER, 550 HZ,.5W, 2 IN. DIA, PC MOUNT
152066	1	CAPACITOR, 220UF, 63V, RADIAL, ELECTROLYTIC
152070	1	CAPACITOR, 1000UF, 10V, 20%, ELCTLT, RADIAL,
152084	1	CAPACITOR, 470UF, 25V, 20%, AL, ELCTLYTC,.2
152086	1	CAPACITOR, 1000UF, 16V, 20%, AL, ELCTLYTC,.2
153058	1	CAPACITOR, 4700PF, 50V, 10%, X7R, CERAMIC, S
154062	4	CAPACITOR,.01UF, 50V, 10%, X7R, SURFACE MOUN
154065	3	CAP,.1UF, 63V,.2 (5MM) SP, POLYESTER FILM
154072	59	CAPACITOR,.1UF, 50V, 10%, X7R, CER CHIP, S M
154074	2	CAPACITOR, 1.5UF, 25VDC, 10%, TANT, SURFACE M
154079	4	CAPACITOR, 10UF, 16V, 10%, TANTALUM, SURFACE
154080	3	CAPACITOR, 47UF, 10VDC, 10%, TANTALUM, SURFAC
154082	2	CAPACITOR, 22PF, 100V, 10%, NPO, MLTILYR CERA
154084	2	CAPACITOR, 2700PF, 100V, 10%, X7R, MLTILYR CE
154085	2	CAPACITOR, 47PF, 100VDC, 5%, MLTILYR CER, SUR
154093	5	CAPACITOR, 68UF, 16VDC, 10%, TANTALUM, SURF M
154095	4	CAPACITOR, 22UF, 20VDC, 10%, TANTALUM, SURF M
180011	1	FERRITE BEAD, 22 AWG TCW WIRE THRU CORE, 1 TU
180019	1	INDUCTOR, 100UH, 10%, SURFACE MOUNT
180021	1	INDUCTOR, 20UH PARALLEL/80UH SERIES, SURFACE
180022	2	INDUCTOR, 10UH, 10%, SURFACE MOUNT
180029	2	INDUCTOR, 50MHZ CUT-OFF FREQUENCY, SURFACE MO
180030	1	INDUCTOR-CAP, 4700PF, 50VDC, 2A, 3 TERM, SURF
211414	1	CONNECTOR, 4 PIN, PLUG, FRICTION LOCK, PC MOU
211634	1	CONNECTOR, 6 PIN, HEADER, DUAL ROW,.100 SP,
211721	1	CONNECTOR, 7 PIN, HEADER,.079 SPACING, PC MO
211914	1	CONNECTOR, 9 PIN, HEADER, SIL,.100 SP, STRAI
212534	1	CONNECTOR, 20 PIN, RECEPTACLE, SIL,.100 SP,
212609	1	CONNECTOR, 24 PIN, HEADER,.100 SPACING, PC M
215059	1	SOCKET, 32 PIN, LOW PROFILE,.6 SPACING
215074	4	SOCKET, 4 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215075	6	SOCKET, 5 PIN, SINGLE-IN-LINE,.100 SP, PC MO
215076	2	SOCKET, 10 PIN, SINGLE-IN-LINE,.100 SP, PC M
215077	2	SOCKET, 15 PIN, SINGLE-IN-LINE,.100 SP, PC M
230023	1	CRYSTAL, 12.288 MHZ, HC49S CASE
2723-02	00 1	FAB, MAIN BOARD, MODEL 515B & 515C
280222	8	SPACER, LED, FOR 3 LEADS,.25 DIA X.31 L, BL
472198	1	RESISTOR, 3.3 OHM, 1/4W, 1%, CARBON
472200	1	RESISTOR, 5.6 OHM, 1/4W, 1%
472274	1	RESISTOR, 26.7 OHM, 1/4W, 1%
474136	4	RESISTOR, 1K OHM, 1/8W, 1%, SURFACE MOUNT

PART NO	QPA	DESCRIPTION
474138	14	RESISTOR, 100 OHM, 1/8W, 1%, SURFACE MOUNT
474144	5	RESISTOR, 20.5K OHM, 1/8W, 1%, SURFACE MOUNT
474145	6	RESISTOR, 215 OHM, 1/8W, 1%, SURFACE MOUNT
474147	1	RESISTOR, 24.9K OHM, 1/8W, 1%, SURFACE MOUNT
474148	2	RESISTOR, 2.05K OHM, 1/8W, 1%, SURFACE MOUNT
474149	3	RESISTOR, 33.2K OHM, 1/8W, 1%, SURFACE MOUNT
474153	14	RESISTOR, 42.2K OHM, 1/8W, 1%, SURFACE MOUNT
474157	1	RESISTOR, 511 OHM, 1/8W, 1%, SURFACE MOUNT
474160	1	RESISTOR, 5.11K OHM, 1/8W, 1%, SURFACE MOUNT
474165	10	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166	35	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474170	1	RESISTOR, 301K OHM, 1/8W, 1%, SURFACE MOUNT
474172	12	RESISTOR, 10 OHM, 1/8W, 1%, SURFACE MOUNT
474175	3	RESISTOR, 3.92K OHM, 1/8W, 1%, SURFACE MOUNT
474178	1	RESISTOR, 825 OHM, 1/8W, 1%, SURFACE MOUNT
474182	2	RESISTOR, 150K OHM, 1/8W, 1%, SURFACE MOUNT
474185	1	RESISTOR, 150 OHM, 1/8W, 1%, SURFACE MOUNT
474186	6	RESISTOR, 15K OHM, 1/8W, 1%, SURFACE MOUNT
474209	4	RESISTOR, 2.67K OHM, 1/8W, 1%, 1206 STYLE, S
474210	1	RESISTOR, 56.2K OHM, 1/8W, 1%, 1206 STYLE, S
474211	2	RESISTOR, 49.9K OHM, 1/8W, 1%, 1206 STYLE, S
475045	2	E2 POTENTIOMETER, 10K OHM, 20%, SURFACE MOUNT
481546	13	DIODE, MMBD914L, SWITCHING, SURFACE MOUNT
481547	2	DIODE, BAT54, HOT CARRIER SCHOTTKY, SURFACE M
481549	1	DIODE, MBRS140T3, RECTIFIER, SURFACE MOUNT
481552	1	DIODE, MBRS340T3, SCHOTTKY, 40V, 3A, SURFACE
482586	1	LED LIGHT BAR, YELLOW,.36 X.35
482587	1	LED LIGHT BAR, RED,.35 X.35
482588	1	LED BAR GRAPH, 10 ELEMENT, RED, 1 X.400
482589	3	LED 7 SEGMENT DISPLAY, 10MM, BLACK SURFACE, R
482590	3	LED 7 SEGMENT DISPLAY, 14.2MM, BLACK SURFACE,
482591	2	LED, YELLOW,.100 SPACING
482592	1	LED, GREEN,.100 LEAD SPACING
482593	4	LED, RED,.100 SPACING
482594	1	LED, BICOLOR, RED & GREEN, 3 LEAD,.100 SPACI
482596	4	LED, HLMP-C100, RED,.100 SPACING, PC MOUNT
483018	1	TRANSISTOR, MMBT3906T, PNP, SURFACE MOUNT
484060	1	TRANSISTOR, MMBT3904T, NPN, SURFACE MOUNT
484541	1	VOLTAGE REGULATOR, LM317LD, +1.2V - +37V OUT,
484553	1	IC, TL5001CD, PULSE WIDTH MOD CONT, 8 PIN, S
484554	1	VOLTAGE REGULATOR, LT1054CS8, SW CAP, 8 PIN,
484557	1	VOLTAGE REGULATOR, LT1117CST-5, POS, 3 PIN, S
485532	9	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
485540	1	TRANSISTOR, SI9955DY, MOSFET, DUAL, N-CH ENH,
485546	2	TRANSISTOR, VN0605T, N-CHAN ENHANCEMENT MODE,
485547	2	TRANSISTOR, TPS1101D, P-CH ENHAN MODE MOSFET,
486041	1	IC, MAX7219CWG, DISPLAY DRIVER, 8 DIGIT, 24 P
486306	1	IC, MCM60L256AF10, 32K X 8 CMOS SRAM, 100NS
486319	1	IC, MC14020BD, 14-BIT BINARY COUNTER, SURF MO
486320	1	IC, SN74HC14D, HEX SCHMITT-TRIGGER INV, SURF
486321	1	IC, SN74HC138D, 3-LINE TO 8-LINE DECDR, SURF
486323	3	IC, SN74HC573DW, OCTAL D-TYPE LATCH W 3-ST OU

PART NO	QPA	DESCRIPTION
486324	1	IC, DG444DY, QUAD SPST CMOS ANALOG SW, SURF M
486329	2	IC, SN74HC32D, QUAD 2-IN. POS OR GATE, SURF M
486332	2	IC, AD7703BR, 20-BIT A TO D CONVERTER, SURFAC
486333	1	IC, HD64180RCP-6X, 8-BIT MPU, HI INT, 68 PIN
486334	1	IC, MC14051BD, 8-CH ANALOG MUX/DEMUX, 16 PIN,
486342	1	IC, PCD3311CTDS, MUSICAL-TONE GEN, 16 PIN, S
486790	1	IC, TLE2022CD, DUAL OP AMPLIFIER, H SPEED, LO
486794	1	IC, PM7524FS, 8-BIT D TO A CONV, 16 PIN, SURF
486795	1	IC, TLC549ID, 8-BIT A TO D CONV, SERIAL CONTR
486812	1	IC, AD780AR, 2.5 VOLTAGE REFERENCE, 8 PIN, S
486814	1	IC, AD820AR, FET INPUT OP AMP, SURF MNT, 8 PI
487084	3	IC, OP-282GS, DUAL JFET OP AMP, L PWR, H SPD,
487098	1	IC, MAX705CSA, UPROCESSOR SPRVISORY CKT, S MN
487114	1	IC, MC34119D, AUDIO AMPLIFIER, L PWR, 8 PIN,
515074	1	FUSE, PIGTAIL, 1/16A, 125V, V FAST-ACTING, 1.
515083	1	FUSE W FUSEHOLDER, 1A, 125V, V FAST-ACTING, S
515085	1	FUSE W FUSEHOLDER, 2A, 125V, SLO-BLO, SUBMIN,
5965-07	1	PROGRAM, PEEL ASSY, CSIO CONTROLLER, MODEL 51
5966-07	1	PROGRAM, PEEL ASSY, TIMING SEQUENCER, MODEL 5

12.3 *Common Assemblies to both Models 515B & 515C*

6376-01-00 Rear Panel Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2532-01	00	1	POWER SUPPLY BOARD ASSY,
0002	5743-10	01	1	POWER ENTRY MODULE,
0003	5812-10	00	2	SPACER, SUPPORT
0004	5819-01	02	1	GROUND WIRE ASSY, 3 1/2 IN. L
0005	6376-10	00	1	PANEL, REAR,
0006	6376-32	01	1	FACEPLATE, REAR PANEL,
0011	161008		0	ADHESIVE, 242, THREADLOCKER, MED STR, BLUE, 1
0012	216059		1	CONNECTOR, PLUG, POTENTIAL COMPENSATION
0013	280188		0	STANDOFF, 3/8 DIA X 3/8 L, 6-32 THD THRU, ALU
0014	281500		0	NUT, HEX, NO. 4-40, STEEL, CADMIUM PLATE
0015	281501		0	NUT, HEX, NO. 6-32, STEEL, CADMIUM PLATE
0016	285000		0	LOCK WASHER, NO. 4, INTERNAL TOOTH, STEEL, CA
0017	285001		0	LOCK WASHER, NO. 6, INTERNAL TOOTH, STEEL, CA
0018	285046		0	WASHER, FLAT, NO. 6 SAE, 3/8 OD X 5/32 ID X 5
0019	286219		0	SCREW, 6-32 X 1 1/4 (31.8) L, PAN HD, PHILLIP
0020	515023		2	1/2A 250V SLO-BLO (IEC127-111 5X20)

6381-01-00 SpO2 Input Connector Assembly

LINE	PART NO	REV	QPA	DESCRIPTION
0001	5606-16	00	1	DRESS BEZEL, SAO2 INPUT
0002	5642-10	00	0	WIRE, 28AWG, ORANGE, CS95 ALLOY, FEP INSULATI
0003	8884-10	02	1	CABLE, 30AWG, 3 SINGLE & 1 TW SHLD PR, POLYUR
0006	161007		0	ADHESIVE, 414, HIGH STRENGTH, COLOR: CLEAR
0007	211704		1	CONNECTOR, RCPT, 7 PIN, PNL MOUNT, WITH HARDW
0008	211719		1	CONNECTOR, 7 PIN, RECEPTACLE, 28AWG THRU 26AW

LINE	PART NO	REV	QPA	DESCRIPTION
0009	280108		2	SNAP RIVET
0010	608003		0	TUBING, HEAT SHRINK, 1/8 (3.2) DIA, BLACK
0011	608005		0	TUBING, HEAT SHRINK, 1/16 (1.6) DIA, BLACK

6382-01-00 Power Harness Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	211215		1	CONNECTOR, 2 PIN HOUSING, CLOSED END
0002	211413		0	CONNECTOR, 4 PIN, RECEPTACLE, 22AWG
0003	216051		2	TERMINAL, RECEPTACLE, INSUL,.187, 22-18AWG,
0004	605154		0	#22 7/30 TC HOOKUP WIRE, 300V, RED
0005	605156		0	#22 7/30 TC HOOKUP WIRE, 300V, BLACK
0006	608001		0	CABLE TIE,.094 X 3.62L, SELF-LKG, 1/16 TO 5/

6407-01-00 Top Cover Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	5765-16	00	1	TOP COVER, WHITE
0002	6427-32	00	1	LABEL, WARNING, EXPLOSION HAZARD,
0003	5828-32	00	1	LABEL, ISOLATION -
0004	5854-10	00	1	BATTERY SUPPORT,
0005	6409-32	00	1	LABEL, INSTRUCTIONS, TOP COVER,

6408-01 01 Bottom Cover Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	5405-10	00	1	SHIELD, BATTERY, MODEL 515
0002	5409-32	00	1	LABEL, WARNING, POLE MOUNT, MODEL 515
0003	5766-16	01	1	BOTTOM COVER, WHITE, 520A, 1265 & 7100
0004	6473-10	00	1	FOAM TAPE, 1 IN. X 1 IN., MODEL 515B & 515C
0009	161064		0	TAPE, 3/4 X 60 YDS, CLEAR, DOUBLE-SIDED ADHES
0010	240056		4	FOOT, RUBBER,.81 SQ X.3 HI W TAPER, WHITE,

2532-01-00 Power Supply Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2472-02	02	1	FAB, POWER SUPPLY BOARD,
0002	2532-03	00	0	SCHEMATIC, POWER SUPPLY BOARD,
0003	2532-04	XX	0	TEST PROCEDURE, POWER SUPPLY BOARD
0004	5918-10	02	1	XFMR, MAINS, PWR SPLY BD
0011	152029		1	CAPACITOR, 220UF 20%, 35V, ALUM, ELECTROLYTIC
0012	152081		1	CAPACITOR, 6800UF, 35V, 20%, AL, ELECTROLYTIC
0013	154016		5	CAPACITOR,.1UF, 50V,.100 SPACING, DIPPED RA
0014	180014		1	INDUCTOR, 25UH,.25 SPACING, PC MOUNT
0015	211213		1	CONNECTOR, 2 PIN, POST HEADER
0016	211505		1	CONNECTOR, 5 PIN, SQ POST HEADER,.156 SP, FR
0017	470026		1	RESISTOR, 150 OHM, 1/4W, 10%, CARBON
0018	472005		1	RESISTOR, 249 OHM, 1/4W, 1%, CARBON
0019	472016		1	RESISTOR, 2.21K OHM, 1/4W, 1%, CARBON
0020	472022		1	RESISTOR, 4.99K OHM, 1/4W, 1%, CARBON

LINE	PART NO	REV	QPA	DESCRIPTION
0021	472030		1	RESISTOR, 10K OHM, 1/4W, 1%, CARBON
0022	472049		1	RESISTOR, 49.9K OHM, 1/4W, 1%, CARBON
0023	472058		3	RESISTOR, 100K OHM, 1/4W, 1%, CARBON
0024	472065		1	RESISTOR, 200K OHM, 1/4W, 1%, CARBON
0025	472044		1	RESISTOR, 26.1K OHM, 1/4W, 1%, CARBON
0026	472146		1	RESISTOR, 47.5K OHM, 1/4W, 1%
0027	472140		1	RESISTOR, 332K OHM, 1/4W, 1%
0028	472185		1	RESISTOR, 61.9K OHM, 1/4W, 1%
0029	472270		1	RESISTOR, 1.2M OHM, 1/4W, 1%, METAL FILM
0030	474181		1	RESISTOR, 4.3 OHM, 1W, 5%, METAL OXIDE
0031	481022		1	DIODE, ZENER, BZY88C12, 12V, 500MW
0032	481530		1	DIODE, KBU4D, 4 AMP, BRIDGE RECTIFIER
0033	481541		1	DIODE, UF4002, 100V, 1A, FAST RECOVERY
0034	481542		2	DIODE, UF5400, 50V, 3A, FAST RECOVERY
0035	484529		1	VOLTAGE REGULATOR, LM78L05ACZ, 5V, 100MA, TO-
0036	484539		1	VOLTAGE REGULATOR, LT1076CT, 2A, STEP-DOWN, T
0037	485517		1	TRANSISTOR, VN10KM, N-CHANNEL, F.E.T
0038	485527		1	MOSFET, IRF9523,.8 OHMS, 60V, P-CHANNEL, TO-
0039	486716		1	LM393NDUAL COMPARATOR
0040	515046		1	FUSE, 2 AMP, 250V, SLO-BLO, IEC127-II
0042	515503		2	FUSE HOLDER, FOR 5MM FUSES, PC MT, SILVER PLA
0044	161049		0	ADHESIVE, HOT MELT, GENERAL PURPOSE, TAN COLO
0045	260014		1	HEATSINK, BLACK ANODISED
0046	281500		0	NUT, HEX, NO. 4-40, STEEL, CADMIUM PLATE
0047	284200		0	#4-40 X 1/4 SLOTTED BINDING HEAD STEEL CAD. P
0048	285000		0	LOCK WASHER, NO. 4, INTERNAL TOOTH, STEEL, CA

2725-01 00 Power Supply Board Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2725-03	00	0	SCHEMATIC, POWER SUPPLY BOARD, MODEL 515B & 5
0002	2725-04	00	0	TEST PROCEDURE, POWER SUPPLY BOARD, 515B & 51
0003	2725-17	00	1	POWER SUPPLY BOARD SUBASSY, MODEL 515B & 515C

2725-17 00 Power Supply Board Subassy

PART NO	QPA	DESCRIPTION
152029	1	CAPACITOR, 220UF 20%, 35V, ALUM, ELECTROLYTIC
152081	1	CAPACITOR, 6800UF, 35V, 20%, AL, ELECTROLYTIC
154072	5	CAPACITOR,.1UF, 50V, 10%, X7R, CER CHIP, S M
180014	1	INDUCTOR, 25UH,.25 SPACING, PC MOUNT
211213	1	CONNECTOR, 2 PIN, POST HEADER
211505	1	CONNECTOR, 5 PIN, SQ POST HEADER,.156 SP, FR
2725-02	1	FAB, POWER SUPPLY BOARD, 2ND GENERATION
280108	0	SNAP RIVET
474145	1	RESISTOR, 215 OHM, 1/8W, 1%, SURFACE MOUNT
474165	1	RESISTOR, 10K OHM, 1/8W, 1%, SURFACE MOUNT
474166	3	RESISTOR, 100K OHM, 1/8W, 1%, SURFACE MOUNT
474167	1	RESISTOR, 2.2M OHM, 1/8W, 1%, SURFACE MOUNT
474181	1	RESISTOR, 4.3 OHM, 1W, 5%, METAL OXIDE
474211	1	RESISTOR, 49.9K OHM, 1/8W, 1%, 1206 STYLE, S

PART NO	QPA	DESCRIPTION
474214	2	RESISTOR, 332K OHM, 1/8W, 1%, 1206 STYLE, SRF
474215	1	RESISTOR, 2.21K OHM, 1/8W, 1%, 1206 STYLE, SR
474216	1	RESISTOR, 4.99K OHM, 1/8W, 1%, 1206 STYLE, SR
474217	1	RESISTOR, 26.1K OHM, 1/8W, 1%, 1206 STYLE, SR
474218	1	RESISTOR, 47.5K OHM, 1/8W, 1%, 1206 STYLE, SR
474219	1	RESISTOR, 61.9K OHM, 1/8W, 1%, 1206 STYLE, SR
481044	1	DIODE, ZENER, BZX84C12LT1, 12V, SURFACE MOUNT
481530	1	DIODE, KBU4D, 4 AMP, BRIDGE RECTIFIER
481552	2	DIODE, MBRS340T3, SCHOTTKY, 40V, 3A, SURFACE
484559	1	VOLT RGLR, LT1076CT FLOW 30, 2A, STEP DOWN, T
485532	1	TRANSISTOR, 2N7002T1, N-CHAN ENHAN MODE, SURF
485535	1	TRANSISTOR, IRFD9020, P-CHANNEL, MOSFET, 4 PI
486805	1	IC, LM393M, DUAL VOLTAGE COMP, L PWR, SURFACE
515085	1	FUSE W FUSEHOLDER, 2A, 125V, SLO-BLO, SUBMIN,
5918-10	1	XFMR, MAINS, PWR SPLY BD, 515A SB/520A/1265/7

6487-01 00 Rear Panel Assy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	2725-01	00	1	POWER SUPPLY BOARD ASSY, MODEL 515B & 515C
0002	5812-10	00	2	SPACER, SUPPORT, OXYPLETH - 520A
0003	5819-01	02	1	GROUND WIRE ASSY, 3 1/2 IN. L, 0XYPLETH - 520
0004	6487-17	00	1	REAR PANEL SUBASSY, MODEL 515B & 515C
0005	6497-01	00	1	GROUND WIRE ASSY, POWER ENTRY MODULE, 515B &
0006	6498-01	00	1	POWER CABLE ASSY, REAR PANEL, MODEL 515B & 51
0012	210149		1	POWER ENTRY MODULE, SEL FUSE, ON/OFF SW & RFI
0013	216059		1	CONNECTOR, PLUG, POTENTIAL COMPENSATION
0014	280225		0	STANDOFF, 1/2 DIA X 1/2 L, 6-32 F THD, AL W I
0015	281501		0	NUT, HEX, NO. 6-32, STEEL, CADMIUM PLATE
0016	285001		0	LOCK WASHER, NO. 6, INTERNAL TOOTH, STEEL, CA
0017	285005		0	FLAT WASHER, NO. 8, STEEL, CAD PL
0018	286219		0	SCREW, 6-32 X 1 1/4 (31.8) L, PAN HD, PHILLIP
0019	515023		2	FUSE, 1/2A, 250V, SLO-BLO, 5 X 20MM, IEC-127-
0020	161008		0	ADHESIVE, 242, THREADLOCKER, MED STR, BLUE, 1

6487-17 00 Rear Panel Subassy

LINE	PART NO	REV	QPA	DESCRIPTION
0001	6487-10	02	1	REAR PANEL, MODEL 515B & 515C
0002	6487-32	00	1	FACEPLATE, REAR PANEL, MODEL 515B & 515C

13 Schematics and Assembly Drawings

6500-00	Final Assy, Model 515B
6500-09	Overall Wiring Diagram, Model 515B
6500-01	Assy, Model 515B
6550-00	Final Assy, Model 515C
6550-09	Overall Wiring Diagram, Model 515C
6550-01	Assy, Model 515C
6376-01	Rear Panel Assy
2532-01	Power Supply Assy.
2532-03	Schematic, Power Supply Bd.
6487-01	Rear Panel Assy
2725-01	Power Supply Assy.
2725/2726-03	Schematic, Power Supply Bd.
2721-01	Main Board Assy, Model 515B
2722-01	Main Board Assy, Model 515C
2721/2722-03	Schematic, Main Bd. Model 515B/C
2723-01	Main Board Assy
2724-01	Main Board Assy
2723/2724-03	Schematic, Main Board, Model 515B/C

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